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1 JULY 1986

Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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NOTICE

The following selections from Soviet media on the aftermath of the Chernobyl Nuclear Power Plant accident and the mobilization of labor and technology in the clean-up effort will be published in the series USSR REPORT: POLITICAL AND SOCIOLOGICAL AFFAIRS under the subtitle AFTERMATH OF CHERNOBYL NUCLEAR POWER PLANT ACCIDENT. This is a representative list of the items selected for that report.

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WORLDWIDE REPORT

NUCLEAR DEVELOPMENT AND PROLIFERATION

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PEOPLE'S REPUBLIC OF CHINA

DEVELOPMENT OF NUCLEAR INDUSTRY AIMS AT PEACEFUL USES

Beijing JINGJI RIBAO in Chinese 22 Jan 86 p 1

[Article by NCNA corresponts Li Shangzhi [2621 1424 1807], and Yu Jiafu [5713 0159 1788]: "The Peaceful Utilization of Nuclear Energy Is the Basic Policy of China's Development of the Nuclear Industry"]

[Text] Beijing, 21 January (NCNA)--This afternoon party and state leaders Hu Yaobang, Fang Yi, Li Peng, Yang Shangkun, and Hao Jianxiu, joyfully came to Huairen Hall at Zhongnanhai, where they shook hands and greeted 10 experts who have made contributions to the development of China's nuclear industry. Together they sat down and discussed the problems of our country's nuclear industry's peaceful utilization of nuclear energy and our leaders requested that the experts convey their regards to the employees on the nuclear industry front.

The leadership cadre first had a commemorative group photo taken with the experts. Hu Yaobang and Yang Shangkun in separately taking the hands of Jiang Shengjie [1203 5110 7132] and Wang Ganchang [3769 3227 2490] said, "Elderly comrades sit in the front." After these two elderly experts sat in the midst of the leadership cadre Li Peng and Hao Jianxiu allowed Liu Xingzhong [0491 5281 1813], Min Huizhong [7036 5069 0022], Huang Qitao [7806 7871 7118], Yu Min [0060 2404], ?Lian? Peisheng [1014 3932], Qian Gaoyun [6929 4108 7301], Lu Dexian [0712 1779 6364], and Sun Zuxun [1327 4371 6064] and other experts to go to the front. An expert said, "Elders Jiang and Wang represent us." In the midst of everyone's laughter a group photo was taken. During the symposium the central government leadership cadre wholly affirmed the accomplishments made to the development of our country's nuclear industry by the vast number of employees in the Ministry of Nuclear Industry. General Secretary Hu Haobang excitedly said that the nuclear industry front comrades have made precious contributions to the party, the state, and the people. Through their hard work our country has successfully developed nuclear weapons strengthening our country's national defensive strength. At the present time our country has set up a fairly complete nuclear industry system and it has good quality nuclear industry ranks. This is a very great accomplishment. The Party Central Committee, State Council, the Central Military Commission, and the people cannot forget the historical and glorious contributions that they have made. He hoped that the personnel of the Ministry of Nuclear Industry in being expert in one thing and good at many will be engaged in a lot of diversification which positively supports local civilian utilized industries and which will be of development to the civilian utilized industries in making new contributions to the socialist economic construction.

Comrade Li Peng said that for more than 30 years the employees of our country's nuclear industry have relied on their own efforts and arduously struggled to construct a fairly complete nuclear industry system. (For this reason) the quality of our nuclear industry ranks is definitely very good. Although our nuclear technology is still not very advanced there still are not very many countries in the world with this kind of organization.

Comrade Li Peng said that for the purpose of hastening our country's socialistic modernization construction our country's nuclear industry organizations are faced with problems of how to better and more extensively peacefully utilize nuclear energy. The peaceful use of nuclear energy is the basic policy of our country's development of nuclear industry. In this aspect nuclear industry has vast developmental prospects and in the aspect of civilian use it has vast potential. In doing the work on the industries for civilian use the nuclear production of electricity is primary and other industries should be worked on. Although the pace of our nuclear production of electricity is arduous it has already moved forward. To carry out the nuclear production of electricity we should primarily take the route of self-reliance and also the route of importing foreign advanced technology.

Comrade Fang Yi said that we should maintain nuclear industry research ranks and strengthen research into the peaceful utilization of nuclear energy. The scientific and technical personnel of the nuclear industry organizations should work together with universities and localities. This route will become more and more extensive and its future is bright.

Comrades Yang Shangkun and Hao Jianxiu also spoke. They affirmed the work of the nuclear industry front and hoped that the employees would make new accomplishments in the peaceful use of nuclear energy. In the midst of warm talks 10 experts expounded numerous opinions and proposals.

The Ministry of Nuclear Industry's minister, Jiang Xinxiong [5592 1800 2651] and vice-minister, Chen Zhaobo [7115 5128 0591], the National Defense Science, Technology, and Industry Commission chairman, Ding Henggao [0002 5899 7559], the political commissar, Wu Shaozu [0124 4801 4809], and the chairman of the Science and Technology Committee, Zhu Guangya [2612 0342 0068] took part in the symposium.

12670/12232
CSO: 5100/5

TAIWAN

REPORTAGE ON PROJECTED FOURTH NUCLEAR PLANT

AEC Seeks 2-year Postponement

OW122043 Taipei CNA in English 1441 GMT 12 May 86

[Text] Taipei, 12 May (CNA)--The Atomic Energy Council [AEC] hopes that the construction of the fourth nuclear power plant will be postponed for at least two years, AEC Chairman Dr Yen Chen-hsing said Monday in a Legislative Yuan committee meeting.

Yen made the statement when answering interpellations concerning the safety of nuclear power generation by legislators Cheng Yu-cheng, Liang Hsu Tsun-chu, Chou Shr-fu and several others in the budget screening committee's meeting held behind closed doors.

The legislators told local reporters that Yen Chen-hsing expressed in the committee meeting his dissatisfaction with the Taiwan Power Company's handling of nuclear power generation. For instance, they said, Yen complained that Taipower has not yet submitted to the Atomic Energy Council any reports on the evaluation of environmental effects or safety of the projected 4th nuclear power plant.

As a scientist, Yen said, he would like to express his opinion that the construction of the 4th nuclear plant should be delayed for at least two years, according to the legislators.

They quoted the AEC chairman as saying that before he assumed his current post, the Atomic Council had been conservative in its supervising of nuclear safety because it did not want to cause any wrong impression that the Republic of China is developing nuclear weapons. Under his chairmanship, Yen told the legislators that he personally has placed emphasis on and promoted evaluation of nuclear safety.

Study Criticizes Plans

OW311239 Taipei CNA in English 0946 GMT 31 May 86

[Text] Taipei, 31 May (CNA)--A soon-to-be-completed academic evaluation report has put a damper on the projected fourth nuclear power plant.

Yu Chung-hsien, deputy director of the Chung Hua Economic Research Institute, briefed Economics Minister Lee Ta-hai Friday on the contents of the report, which will be officially presented to him sometime next month.

The report, being prepared by a team of 48 scholars at the request of the Ministry of Economic Affairs, said the Taiwan Power Company's cost estimate of NT dollar 178.4 billion failed to take into consideration environmental costs and other attendant costs.

In other words, the cost of nuclear-generated power at the plant will be much higher than the Taipower estimate if other factors are considered.

The report also faulted Taipower's estimate of Taiwan's future power needs. It says the projection that power supplies in Taiwan will fall behind demand by the turn of the decade is unreliable because it contains too many variables.

The report also mentioned a pre-Chernobyl public opinion survey which showed that the majority of academicians and parliamentarians was against building the nuclear power plant.

The institute also conducted another poll to assess public opinion in the wake of the Soviet nuclear accident.

The government has listed the nuclear project as one of the nation's 14 key development projects to be completed in the next several years. Site preparation for the plant has already cost several billion new Taiwan dollars.

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CSO: 5100/6

CANADA

MULRONEY RAPS CHERNOBYL NEWS BLACKOUT

Ottawa THE CITIZEN in English 20 May 86 p A3

[Article by Lesly Bauer]

[Text]

Prime Minister Brian Mulroney has sharply rebuked the Soviet government for not giving out more information on the nuclear accident in the Ukraine.

And, in an unusual gesture, government leaders joined members of Canada's Ukrainian community in a rally on Parliament Hill to condemn the Soviet Union's secrecy.

In a letter to those at the rally Mulroney used some of the strongest language from the government to protest the Soviet Government's tight grip on information.

Finance Minister Michael Wilson read the message to about 1,100 Canadians with ties to Eastern Europe who came to Ottawa from as far away as London, Ont., Toronto and Montreal to protest Soviet policy.

"It is simply not good enough to offer momentary partings of the veil of secrecy which surrounds the accident and its ongoing impact," Mulroney said.

"We need to know who the casualties are, so that Canadians may come to the assistance of their friends and families. It is inhumane to impede communication between Canadians and their kin in Ukraine."

Mulroney aides were unavailable for comment on whether the prime minister's views have been conveyed directly to the Soviet government.

The demonstrators said efforts to reach relatives near the accident have been futile.

"A lot of us have tried to reach family but you get told the lines are busy or there's phone trouble. People have waited for hours on hold," said Ulana Oleksyshyn of Toronto.

Even for those lucky enough to have reached relatives by phone or letter there is a fear that a strong warning or vivid account of events as they are seen in the west may lead to trouble.

"Letters are all opened, and often don't get through. Those people (to whom the letters are mailed) may be harassed," said Lada Toptschen of Ottawa.

They also say it has been impossible to get casualty lists or locations of people who were moved because of the accident.

Dr. Robert Gale, a U.S. bone marrow specialist who returned Friday from the Soviet Union, indicated in Los Angeles that as many as 13 people have died

Soviet newspapers suggest the death toll is 10.

Wilson assured the crowd the government would do everything possible to pressure the Soviet government to be more open.

Health minister Jake Epp also spoke, demanding "complete and accurate information" and vowing to "press the Soviets for full disclosure".

Besides wanting information, the demonstrators said they wanted to be able to send food and medication to those in need.

Epp was presented with packages of powdered milk and boxes bearing red crosses by several children in a symbolic appeal to let outside help reach Ukraine.

After the speeches, the crowd marched to the Soviet Embassy chanting " release information, not radiation".

At the Charlotte Street embassy they sang a funeral hymn called *Eternal Remembrance* and a song called *Ukraine is not Dead.*

Marta Nazaire, dressed in black and wearing a black veil in symbolic mourning for the victims of the accident, placed a wreath of white lillies at the door of the embassy.

/9274
CSO: 5120/40

CANADA

RADIATION LEVELS MEASURED FOLLOWING CHERNOBYL

16 May Report

Ottawa THE CITIZEN in English 16 May 86 p E1

[Article by Cathy Campbell]

[Text]

The amount of radioactive iodine found in Ottawa milk samples Wednesday was 10 times greater than in milk tested Tuesday, but still well within safe levels, says Health and Welfare Canada.

Low levels of radiation from the Soviet nuclear accident April 26 in the Ukraine have also been found in milk in Toronto and Fredericton, said department officials.

Department spokesman Carole Peacock said Thursday the level of Iodine-131 in milk samples has increased from .06 becquerels per litre in Ottawa to .5 becquerels per litre. The maximum acceptable level in milk is 10 becquerels, about 20 times above the level found in Ottawa.

In 1964, when nuclear fallout was circling the globe because of atmospheric weapons tests, the maximum concentration of Iodine-131 detected in milk was three becquerels per litre, six times higher than the latest Ottawa reading.

The standard of 10 becquerels per litre means that if a person drank two litres of the tainted milk a day for life, there would be a one-in-a-million chance of developing cancer, experts say.

Radiation from the Chernobyl accident site, which is almost 5,000 miles from Ottawa, has been detected in rain and air samples across the country, from St. John's, Nfld., to Vancouver and from Windsor to Inuvik.

A sample of rainwater from Ottawa last week showed concentrations of 60 becquerels per litre, six times the federal standard, prompting government health officials to advise Canadians not to drink rainwater.

Results from rain tested in Ottawa Thursday were to be available today.

Federal health officials are still cautioning people who depend on pure rainwater as their source of drinking water not to drink the tainted water.

Peacock said the department continues to be inundated with phone calls from pregnant women, nursing mothers and mothers of young children, who are worried about the health risk of drinking milk.

She said health officials are telling them to continue drinking milk because it poses no health problem.

While the levels of radioactive iodine found in milk have risen, tests show the concentration in air and water seems to be going down, said Peacock.

Milk samples will be tested daily in 16 places across Canada because there is some concern radiation fallout from a nuclear accident could enter cows through the grass they eat.

Testing of Canadian-grown produce has so far turned up no radiation but customs officers in Toronto have seized a shipment of French lettuce and herbs that exceeded the government's new guidelines on radiation levels in fresh produce. The new standard is 70 becquerels per kilogram.

22 May Report

Ottawa THE CITIZEN in English 22 May 86 p B1

[Article by Jane Defalco]

[Text]

Health and Welfare Canada has lifted its warning against drinking rainwater after recent tests in several cities including Ottawa showed no trace of radioactivity in rain.

"There has been a continuing trend of decreasing radioactivity contamination in air and rainwater and we expect that trend to continue," said department spokesman Carole Peacock. "That is why we have lifted the advisory against drinking rainwater."

Peacock said the government will continue to closely monitor milk, fresh produce, rain and air "until we are completely assured that the environment is free of radioactive Iodine-131."

Water from Tuesday's rain in Ottawa had no detectable radioactivity. Samples from last week's showers showed radioactivity had dropped to well within safe levels, but the warning not to drink rainwater remained in effect.

Ottawa rain on May 15 contained seven becquerels of Iodine-131 per litre, well within the maximum acceptable standard of 10 becquerels.

The previous week's samples contained 60 becquerels per litre — six times the standard. That high level prompted the warning against drinking rainwater.

Peacock said rainwater tested everywhere else in Canada since May 18 has been found to contain less than the standard of 10 becquerels per litre of Iodine-131.

Peacock added the latest air samples from Winnipeg, Toronto, Windsor and Fredericton were also free of any trace of the radioactive iodine resulting from the nuclear disaster in Chernobyl.

Harmless traces of radiation continue to be found in milk samples, while Iodine-131 concentrations have increased slightly in Vancouver and Edmonton, two cities where concentrations in rain have been the highest.

24 May Report

Toronto THE GLOBE AND MAIL in English 24 May 86 p A4

[Text]

OTTAWA-

Radioactive iodine-131 has now been found in most locations across the country where sampling is being carried out, the federal Health Department reported yesterday.

In all cases, however, the levels are low and do not pose a risk to health, the department said in a news release.

From samples taken Wednesday, iodine-131 was found in milk in Vancouver, Edmonton, Calgary, Regina, Saskatoon, Winnipeg, Thunder Bay, Windsor, Ottawa, Montreal, Moncton and Halifax. Radiation was not detected in samples from Sault Ste. Marie, Ont., Toronto, Quebec City, Sussex, N.S., and St. John's, Nfld.

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CSO: 5120/40

CANADA

WORLD ENVIRONMENT HEARING RECEIVES NUCLEAR INDUSTRY BRIEF

Ottawa THE CITIZEN in English 27 May 86 p A3

[Article by April Lindgren]

[Text]

A Canadian nuclear industry brief contending that there is excellent international co-operation on nuclear matters has drawn skeptical responses from members of the World Commission on the Environment and Development.

With the nuclear power plant accident at Chernobyl in the Ukraine fresh in their minds, some commissioners seemed surprised by the Canadian Nuclear Association brief.

The brief said that "the international co-operation which has marked the development of peaceful nuclear technology provides an excellent model" for other technologies.

It was presented by an association that represents more than 140 companies involved in the nuclear industry on the first day of public hearings by the commission in Ottawa.

Janez Stanovnick, the Yugoslav representative on the commission, reminded Canadian Nuclear Association vice-president Ian Wilson that it took the Soviet Union three days to report the Chernobyl accident to the International Atomic Energy Agency despite agency rules that require immediate notification.

Fallout from the Chernobyl accident a month ago was "so severe that the entire spring crop in my country had to be destroyed this year," Stanovnick said, noting that radiation levels on May 1 were more than 400 times normal.

Wilson said "lines of communication" were just starting to develop with the Soviets prior to the Chernobyl accident.

"Unfortunately, it wasn't fast enough," he admitted. Most of the international co-operative efforts have been confined to western nations, he said later in an interview.

The commission, which is holding two days of public hearings on environmental issues here, is conducting similar forums worldwide in preparation for a state of the environment report and recommendations to be presented to the United Nations in 1987.

The commissioners, headed by Norwegian Prime Minister Gro Harlem Brundtland, heard numerous references to the Chernobyl incident Monday.

"Chernobyl has dramatized once again that, as Marshall McLuhan said, we are living in a global village and that our only one earth compels us to share a common destiny," Brundtland said in her opening remarks.

"The tragedy of Chernobyl could have happened anywhere, and it ensures that the debate on these issues will continue in all countries."

She said the commission has asked the International Atomic Energy Agency for a report on the Chernobyl accident and its implications. The report will be part of the commission's deliberations before it delivers its own recommendations to the United Nations, she said.

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CSO: 5120/40

CANADA

AECL 'BABY' NUCLEAR POWER REACTOR PROJECT CRITICIZED

Ottawa THE WEEKEND CITIZEN in English 24 May 86 p A20

[Article by Rick Boychuk]

[Text]

MONTREAL — Last year, the boys from Atomic Energy of Canada Ltd. tried to sell Mark Gordon, president of an Inuit-owned financial corporation, a nuclear reactor. A small one. Just big enough to power a village of up to 6,000, a factory, mine or hospital, or perhaps a shopping mall.

"They said it was very different technology from the big Candu (the first commercial electricity-generating reactor developed by AECL)," said Gordon, who heads Makivik Corp. which administers funds awarded to Quebec Inuit under the James Bay and Northern Quebec Agreement.

After years of design work and marketing studies, AECL has begun beating the bushes for buyers for its new reactor, the latest development in nuclear technology, which can produce electricity and hot water for heating buildings.

AECL is trying to sell the reactors now but it will take at least two years to build the first one.

Nuclear industry critics say the concept of baby nukes powering villages or hospitals or shopping malls is a nightmare.

Norm Robin of Energy Probe in Toronto who labels the idea "crazy" said: "They want to run these things unattended. If there was a failure, there is no way you could evacuate a shopping mall or hospital in time. It is one of the dumbest ideas I've heard in a long time."

Gordon Edwards, president of the Canadian Coalition for Nuclear Responsibility in Montreal, said although the AECL will assure the public that the reactors are safe, "we have had enough experience with technology that we aren't so naive as to accept these assurances."

The Inuit are not about to serve as AECL's guinea pigs, said Mark Gordon. "Let them put the first one in the south somewhere."

AECL expects considerable public opposition to the new generation of reactors called the Slowpoke Energy System. The April 26 reactor fire at the Chernobyl nuclear power plant in the Ukraine generated more skepticism about the safety of nuclear energy.

But AECL officials say their new reactor is as safe as the tiny research reactors, also called Slowpokes, that have operated at four Canadian universities since the early 1970s. The development of the new Slowpokes was based on some chilling reasoning about public opinion.

John Hilborn, the AECL research scientist who designed the original Slowpoke, noted in a paper delivered to a meeting of the Canadian Nuclear Society in 1981 that fear of nuclear accidents and radioactive contamination "may hinder the widespread use of small reactors."

Yet, Hilborn said, "It is now well known that people will ac-

cept frequent, small disasters more readily than rare catastrophes."

AECL official Metro Dmytriw said the company threw its marketing activities for the new reactor into high gear last spring after Finance Minister Michael Wilson announced the Crown corporation's research and development budget would be cut by half, to $100 million annually, by 1990.

The company immediately formed a special business unit for the new reactors.

AECL marketing people are doing a study of the energy needs of the community of Hay River in the Northwest Territories and have asked Hydro-Quebec officials whether they are interested in the village-sized reactors for energy needs in northern communities.

As well, AECL is talking seriously with China and South Korea.

The corporation is ready to commit a commercial unit any time although the prototype reactor under construction at AECL facilities in Manitoba won't be operational until September.

That's not a problem, he said, because even if a buyer stepped forward it would take about two years to do the engineering studies and construct it.

Hydro-Quebec official Roberta Brunette said the utility has not rejected the possibility of using Slowpokes in the north, but for the moment no one is actively studying the question.

According to documents obtained under the federal access-to-information law, AECL scientists believed in 1983 that the fuel would have to be replaced every two years.

Dmytriw said scientists now believe the fuel will need to be replaced every five to eight years.

Dmytriw insists the new Slowpokes will be so safe and simple to run that AECL hopes they will operate unmanned for weeks at a time. But he acknowledges the new reactors will generate radioactive gasses which will have to be vented into the air.

The Atomic Energy Control Board, which regulates the nuclear industry in Canada, has set what it considers acceptable limits for such gas venting. The venting would be done in controlled circumstances, Dmytriw said.

But Edwards said some of those gases may contain radioactive particles that would remain radioactive for years and build up in the environment. "It would be a problem that escalates over time," he said.

The reactors also would have water filters that would accumulate radioactive particles and would have to be replaced regularly, Dmytriw said. The filters, like the spent fuel and any other materials that become contaminated with radioactive particles, would be shipped in secure containers to AECL's research stations at Chalk River in Ontario or Whiteshall in Manitoba.

There, the wastes would be stored temporarily until AECL and the federal government come up with a permanent waste-disposal site. Such a facility is not expected to be in operation until the 1990s at the earliest.

Rubin and Edwards say it is folly to start selling the new Slowpokes before Canada comes to terms with nuclear-waste storage. Edwards said the Slowpokes are a desperate gambit by AECL to maintain a position in the reactor market.

But the Inuit are not interested. Hydro-Quebec has put the issue aside and anti-nuclear members of the legislative assembly in the Northwest Territories gave AECL officials a rough ride when they tried to sell the Territories government on the idea.

But the company may have a contingency plan.

Documents show that as far back as 1982, AECL and the Department of National Defence were discussing the possibility of installing a Slowpoke at Canadian Forces Station Alert on the north coast of Ellesmere Island.

Dmytriw says there have been discussions with the defence department and nothing more.

"If we can't show they are safe, then the military isn't going to want them either."

Dmytriw also says that AECL would have to jump through all sorts of regulatory hoops to install a reactor at Alert, just as it would if the company installed a reactor in southern Canada.

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CSO: 5120/40

BULGARIA

SCIENTISTS EXTOL WORK AT DUBNA NUCLEAR RESEARCH INSTITUTE

Sofia OTECHESTVO in Bulgarian 25 Mar 86 pp 16-19

[Text] On the initiative of the Soviet government, in March 1956 representatives of the charter member-countries of the Dubna Joint Nuclear Research Institute signed an agreement on its organization. Today it is one of the leading international scientific centers in the world, where joint research is conducted by scientists from Bulgaria, Vietnam, the GDR, the KPDR, Cuba, Mongolia, Poland, Romania, the Soviet Union, Hungary and Czechoslovakia. The institute's scientific program covers virtually all areas of basic research on the structure of matter. More than 350 scientific organizations from the 11 countries are participating in its implementation.

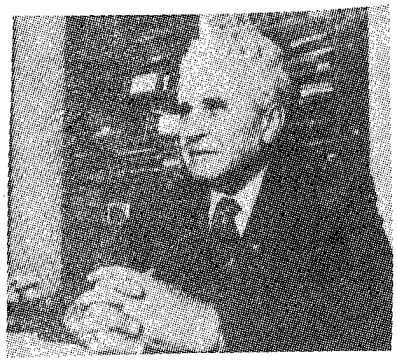
To Bulgaria, the past 3 decades have meant the following: more than 350 scientists have spent long periods of time working in Dubna (from 3 to 18 years). It also means one discovery, 26 doctoral and more than 100 candidate dissertations and more than 3,000 scientific papers published in prestigious international publications. Today Bulgarian physicists are participating in the development of 60 of the 95 scientific research problems included in the institute's problem-topic plan.

Five noted Bulgarian physicists describe the significance of this cooperation in the development of science and education in our country.

On the Front Edge of Knowledge, by Academician Khristo Khristov

Nuclear Science is at the cutting edge of the knowledge of matter and is penetrating most profoundly into the essence of processes and phenomena and the laws of the microworld. However, it is also a very expensive science, for modern apparatus and equipment used in such research are more complex than a big plant, in terms of scale, appearance and method of organization, and cost billions of leva. The only way of achieving something major in this area is for scientists and even entire countries to join efforts. It is precisely such an opportunity that the Dubna Joint Nuclear Research Institute offers to us. I was one of the members of the Bulgarian delegation at its founding, 3 decades ago. Since then, as an associate, member of the scientific council, deputy director and, for the past 15 years, representative of our country, I have maintained relations with a number of laboratories. I work as a specialist and organizer and I am convinced that this institute will exist and

develop for many more years, for nuclear science has given mankind a great deal but could give even more. Nature zealously protects its secrets but our past accomplishments prove that we are on the eve of new practical, experimental and theoretical accomplishments which will create even greater interest in problems of nuclear physics.



Academician Khristo Khristov, director of the Bulgarian Academy of Sciences Institute of Nuclear Research and Nuclear Power Industry

I shall mention briefly some of the most modern trends in which work is being done in the six Dubna laboratories. (In Dubna that concept is different from ours. Actually, each one of the laboratories is a separate institute with its own problems to resolve, scientific council and personnel ranging from 500 to 1,000 people.)

The new science known as relativistic nuclear physics is currently being developed at the high-energy laboratory, in the research of which we are actively participating (Corresponding Member Professor Pavel Markov, from our nuclear institute, and Docent Velko Zayachki, from the Higher Chemical-Technological Institute in Sofia, were recently awarded the title of Discoverers, along with a group of Soviet specialists). This science deals with the processes occurring in the nucleus at energies typical of the physics of elementary particles. Studies of muon nuclear catalysis are very promising. The nuclear problems laboratory has determined that resonance conditions are created in a space between atoms 200 times smallerthan the ordinary (achieved by replacing electrons with muons), in the course of which the merger of the nuclei of deuterium and tritium and the release of corresponding energy becomes quite likely. The interest in this phenomenon has increased greatly.

The properties of new transuranic elements continu to be studied at the nuclear reaction laboratory. A Bulgarian group at the neutron physics laboratory (headed by Academician I.M. Frank, Nobel Prize winner) is working on the problem of the neutron's electric neutrality. Experimentation alone can determine whether it has any kind of charge. This problem is of

exceptional theoretical or, rather, cosmic physical significance. Should it turn out that neutrons have a charge this would explain the fact noted by astronomers that the farther away a stellar association, galaxy or metagalaxy is from us, the greater the speed at which it distances itself from us. The computer and automation laboratory is developing the topical area of so-called analytical computations. Here results are provided not with individual figures but formulas which contain much more information and are applicable in a larger number of cases.

An entire school of Bulgarian specialists was trained at the theoretical physics laboratory on approaches to the theory of elementary particles and models of nuclei. Today they are doing successful work in our country in science and education.

This is merely a partial illustration of what is being done at the joint institute. Dubna is a promised land, a dream of all of our physicists. It is a center of scientific and applied research in which international cooperation and socialist integration are actually taking place.

Professor Doctor Zhelyu Zhelev, Deputy Director of the Nuclear Research and Nuclear Power Industry Institute

Experience of the Great Schools, by Professor Zhelyu Zhelev

I work in the field of nuclear spectroscopy (study of the characteristics and structure of atomic nuclei) and I shall discuss the role of the joint institute in its development. So far 110 elements are known (only 2 atoms of the last one, No 110, has been discovered!), and some 1,900-2,000 varieties, known as isotopes. Theoretically, however, the existence of about 7,000 isotopes has been predicted! The synchrocyclotron of the nuclear problems laboratory in Dubna, where the first department of nuclear spectroscopy was organized in 1959 and a strong radiochemical group for the development of various research methods was created, offers great opportunity for their discovery and their study.

In the course of these 3 decades the international collective at the laboratory has carried out an extensive program. More than 120 new isotopes and many isomers were discovered and valuable information was obtained concerning the quantum characteristics of the nuclei. Joint work done in the field of nuclear spectroscopy, in which many Bulgarians had the opportunity to participate, was exceptionally useful and yielded interesting results. Thanks to scientific cooperation with the joint institute, within a relatively short time we were able to organize in Bulgaria as well nuclear spectroscopy and radiochemistry laboratories, apply the experience acquired in Dubna and apply and perfect the methods we leaned there. As a result, during the 8th 5-Year Plan our two laboratories made an economic contribution in excess of 20,100,000 leva with total economic benefits in excess of 6.3 million leva.

A creative atmosphere and excellent microclimate are typical of the international collectives in Dubna. Personally, both as a beginning young specialist and to this day, I find it very pleasant to work with the familiar Soviet scientists Corresponding Member V. Dzhelepov, Corresponding Member V. Petrovich, Professor K. Gromov and others. Our other colleagues have also maintained long and fruitful cooperation with the creative workers at the nuclear problems laboratory. For example, a great deal of interesting research on highly excited particles has been carried out by a collective headed by Professor Doctor Emil Nadzhakov, while a group headed by Professor Doctor Nikola Balabanov, participated in studies and development of unique equipment in the area of neutron physics. For 10 years I have headed our people in Dubna and I know that Bulgarians are sought-after and desired partners in joint scientific activities.

Past experience indicates that the joint institute, this first offspring of scientific integration, played a tremendous positive role in the development of contemporary physics not only for the members of the socialist community but on a worldwide scale as well. Dubna has also become a center for upgrading the skills of many specialists from participating countries. It has had a tremendous impact on the development of our national institutes and laboratories. This prestigious name is today invariably linked with the discovery of new physical phenomena and the development of new scientific areas.

High Vocation, by Corresponding Member Professor Pavel Markov

The task of the high energy laboratory, which was among the first to be set up at the Dubna Joint Nuclear Research Institute, was to organize scientific research with the synchrophasotron, which was the biggest accelerator for its time. It was with this accelerator that for the first time a bunch of protons with a then unparalleled energy of 10 billion electron/volts was obtained in April 1957. The laboratory's director was the noted Soviet Academician V.I. Veksler. Together with a group of associates, he was awarded the Lenin Prize in 1959 for the development of this unique, complex expensive appliance.

Corresponding Member Professor Pavel Markov

I began work at Academician Veksler's laboratory immediately after the synchrophasotron was commissioned in 1957. Throughout the world, the scientific public was awaiting with tremendous interest the initial results of the study of nuclear interaction with protons at such a record-setting energy. After information was obtained on the most general characteristics of the interactions, the scientists from the member countries participating in the joint institute began to study and seek more efficient methods for the study of the phenomenon of elastic dispersal of protons. The most promising and effective was the so-called small-target method which, substantially improved subsequently, was applied in the studies conducted with the more powerful boosters which built in Serpukhov (USSR), Batavia (United States) and Geneva (Switzerland). The results of the elastic dispersal at even greater energies led to the development of theoretical research. It turned out, for example, that the dimensions of the proton thus determined increase with increases in energy. We made this discover in 1967-1968 and, after it was confirmed by other laboratories throughout the world, in 1982 we were awarded a discovery diploma by the USSR State Committee for Inventions and Discoveries.

In addition to studies involving nuclear emulsions, other groups of physicists were applying for the first time the new and more promising methods of bubble chambers. Dozens and hundreds of thousands of photographs obtained in working with them are being analyzed, measured and examined by many physicists and laboratory technicians. Special computerized and automated systems and suitably developed computer methods, algorithms, and program packets and libraries were developed to process this huge amount of experimental data. The long years of research were richly rewarded: new elementary particles and new laws of interaction among various types of particles--pions, kaons and nuclons--were discovered.

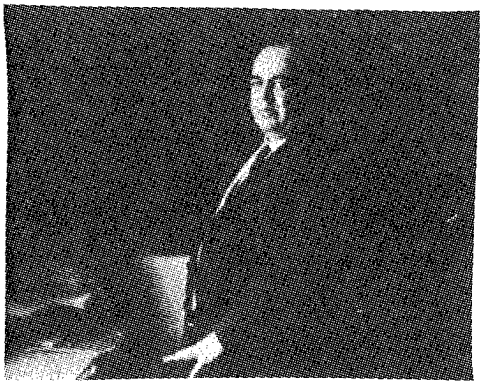
The rapid progress of contemporary microelectronics contributed exceptionally greatly to the development of so-called electronic experiments. In recent years a number of original experiments were successfully carried out with the Dubna and Serpukhov accelerators, which are designed, developed and applied by numerous international collectives of engineers and technicians, physicists and mathematicians, headed by noted and talented young and experienced Soviet

scientists. The result was exceptionally valuable and interesting and important data on the mechanism of the birth and decay of a number of new strange and charm particles and new pion resonances; a number of laws on strong and weak interaction were discovered.

The scientific results achieved by the physicists at Dubna have been published in a number of articles, and reported at world, regional and national conferences, seminars and symposia on high energy physics. Every year the best scientific works have been awarded the prizes of the joint institute and USSR Lenin and State prizes.

The participation of Bulgarian scientists in the Dubna program in the area of experimental research in high-energy physics opened the way to the creation and development of a Bulgarian school. Currently some 35 members of the Institute of Nuclear Research and Nuclear Energy of the Bulgarian Academy of Sciences and the physics chairs of the VKhTI and Lenin VMEI in Sofia, the Kliment Okhridski Sofia University and the VMEI in Varna are working in this area. Working shoulder to shoulder, scientists from the Soviet Union and the other socialist countries have developed as highly skilled cadres who can resolve difficult problems in high-energy physics. Unfortunately, material facilities and, particularly, computers in our country are far from matching the needs and skills of our scientists.

We hope that the decisions of the February 1985 Plenum will provide a new powerful impetus to the development of this branch of physics in Bulgaria and that conditions will improve substantially, thus enabling us successfully to put a number of new methods to practical use.



Professor Doctor Ivan Zlatev, Head of Theoretical Physics Chair, Kl. Okhridski Sofia University

Full Opportunities, by Professor Doctor Ivan Zlatev

I was one of the first Bulgarian specialists to be assigned to work at the Dubna Joint Nuclear Research Institute in 1957. I had already defended my candidate dissertation in Bulgaria and was teaching at the university. At that time, the condition of physics in our country was not particularly brilliant. For example, here and there something could be heard about quantum

electrodynamics and the quantum theory of fields, but no one was studying such problems seriously and in depth. At that time the great Soviet mathematician and physicist Academician Nikolay Bogolyubov, today's institute director, was the director of the theoretical physics laboratory in Dubna; his deputy was Anatoliy Logunov, today an academician, deputy president of the Soviet Academy of Sciences and Moscow State University rector. They interrogated me somewhat as to what I had heard at the university and what I knew. Initially, they assigned me to study the quantum theory of fields. I studied for 3 months, after which Bogolyubov gave me my first assignment. It was "academic" (for it had no relation with the real experiment), the dispersal pi-mesons into pi-mesons. After I had provided the proof that was being sought, together with Petr Isayev, today a professor, I was assigned to make the necessary computations to test the quantum electrodynamics at small distances. My cooperation with him lasted 2 years. We published a number of scientific works.

Back in Bulgaria, as early as 1960, I began to teach a course on the quantum theory of fields. For the first time our students had the possibility to hear about a new development in this contemporary area. In 1979 I returned to Dubna for a period of 4 years, this time as institute deputy director.

The time I spent at the theoretical physics laboratory was one of the happiest times in my life. The people there were exceptionally hospitable and showed a tremendous desire to help us to enter and do serious work in the most topical areas of our science. To this day I regularly collaborate with my Dubna colleagues and visit them at least once a year to keep in touch. Happily, that institute highly values and welcomes Bulgarian scientists with pleasure. All of us have many good friends there.

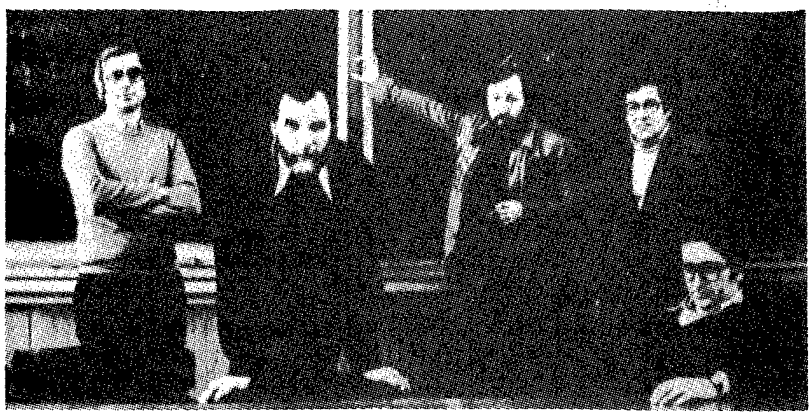
In the course of these decades the Dubna Institute expanded and our cooperation broadened steadily. This is a huge and unique school for our physics, which offers the scientist a set of problems and the possibility of rapidly reaching the cutting edge of the science, surrounded by people with whom he exchanges ideas. It is the "kitchen" of scientific creativity--of all the work that stands between research and books, which is the essence of creation and cannot be found anywhere else.

In Dubna we and our colleagues in the entire socialist camp were granted a unique opportunity to do serious work on nuclear and elementary particle physics, to use modern experimental systems and unique devices. The joint institute welcomes its 30th anniversary on the eve of a new blossoming: its scientists will participate in experimentation in two unique devices which are being created: the largest accelerator in the world in Serpukhov and the so-called "meson factory" in Troitsk.

I frequently say "our" Dubna, for there we truly feel at home. We work as full members of an international collective. Our participation in the joint nuclear research institute exceptionally enhanced the experimental and theoretical level of our physics and related electronics, computers, etc. Furthermore, it confirmed the fact that enhancing the level in one area of physics entails increased opportunities in other area, for the people emulate those who are most advanced. Such cooperation has enhanced the overall

standard of Bulgarian science. This applies to education as well, for today Sofia University is offering courses which are not taught in many famous universities throughout the world; let us not mention the hundreds of publications in prestigious international periodicals and the many candidate and doctoral dissertations defended on topics related to most relevant areas.

Today physics cannot develop as a "cottage industry." It must be internationally acknowledged and be of international significance. The happy opportunity for us to be full participants in the joint nuclear research institute provides us conditions for doing precisely this kind of work.



Seminar at the Theoretical Physics Laboratory. Left to right: Professor Matey Mateev, Professor Vladimir Kadishevski, Senior Scientific Associate Vladimir Mavrudiev, Docent Rustan Ibadov and Senior Scientific Associate Aleksandur Donkov

In Science and Life, by Professor Doctor Matey Mateev, Deputy Rector of Kl. Okhridski Sofia University

The Dubna Joint Institute has been for a long time and remains the only world-class scientific research center to which Bulgarian scientists have mass access. A new, until recently unknown and qualitatively broad spectrum of physical research is developing as a result of our increased number of scientists who have worked there. Gradually, the level of research and skill of scientists in this area have developed into a standard for those working in other areas of physics.

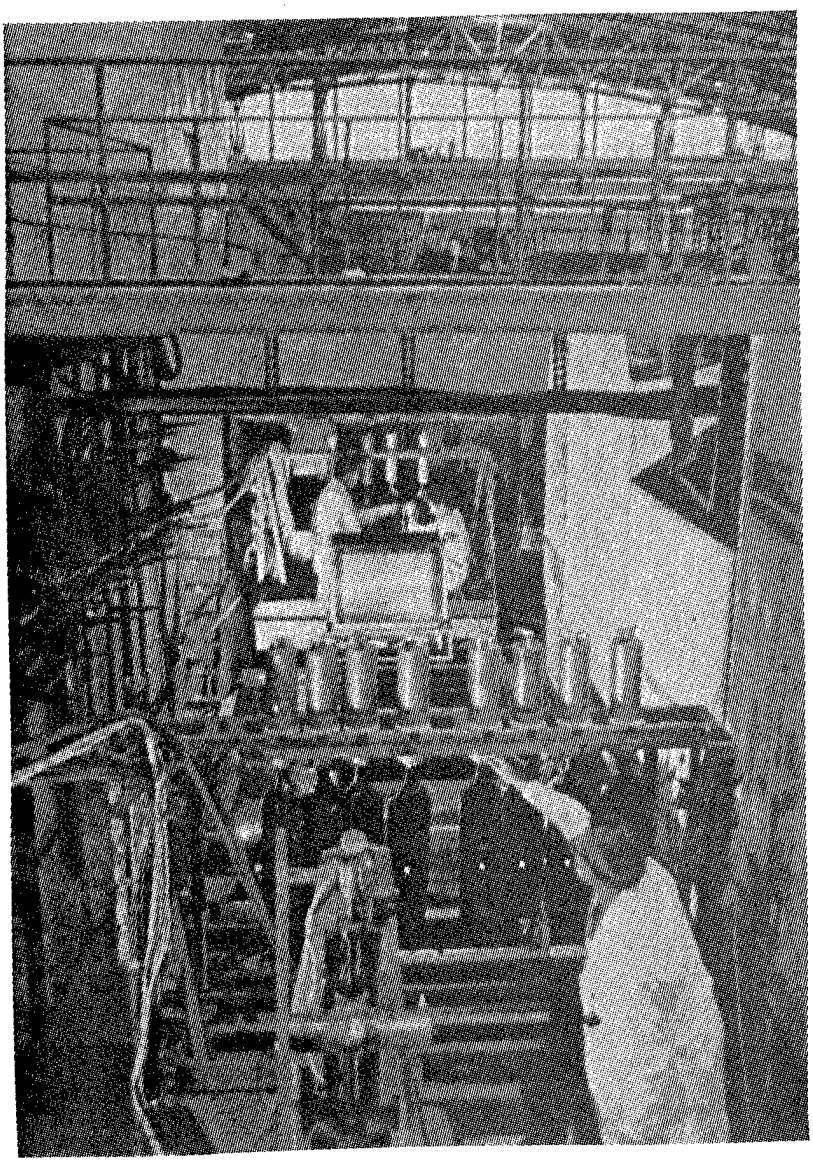
Institutes such as Dubna are particularly valuable to small countries such as Bulgaria. They make it possible with minimal capital investments for a relatively large group of scientists to work on the cutting edge of human knowledge on the structure of matter. Studies of such an extremely advanced nature have been and are sources of new demands concerning industry and technology and the foundations of future scientific and technical progress. Naturally, they also substantially contribute to enhancing the overall scientific standard in the country.

Another substantial benefit is that the flow of information can drown the contemporary scientist and merely to follow its development a person has to spend more time in a day than there are hours. Furthermore, articles published in periodicals appear from 6 months to more than 1 year after the study has been completed, and in frequent cases the information has already become hopelessly obsolete. Such is the fate of the isolated scientist: he is always behind and is frequently working on the periphery of knowledge. In a large scientific collective a person can obtain the necessary information without going to the library and, in frequent cases, before results have been published. Here one is always in step with developments in his area. Knowledge of what is important and on which other people are working simply seems to be hovering in the air and is actually obtained effortlessly. In such a collective surprises are virtually impossible and the collective is always on the cutting edge of science. Personal contacts and endless debates and discussions are the regulator which earmarks the way to future activities and optimizes decisions, from problems of scientific policy to surmounting minor difficulties in daily work.

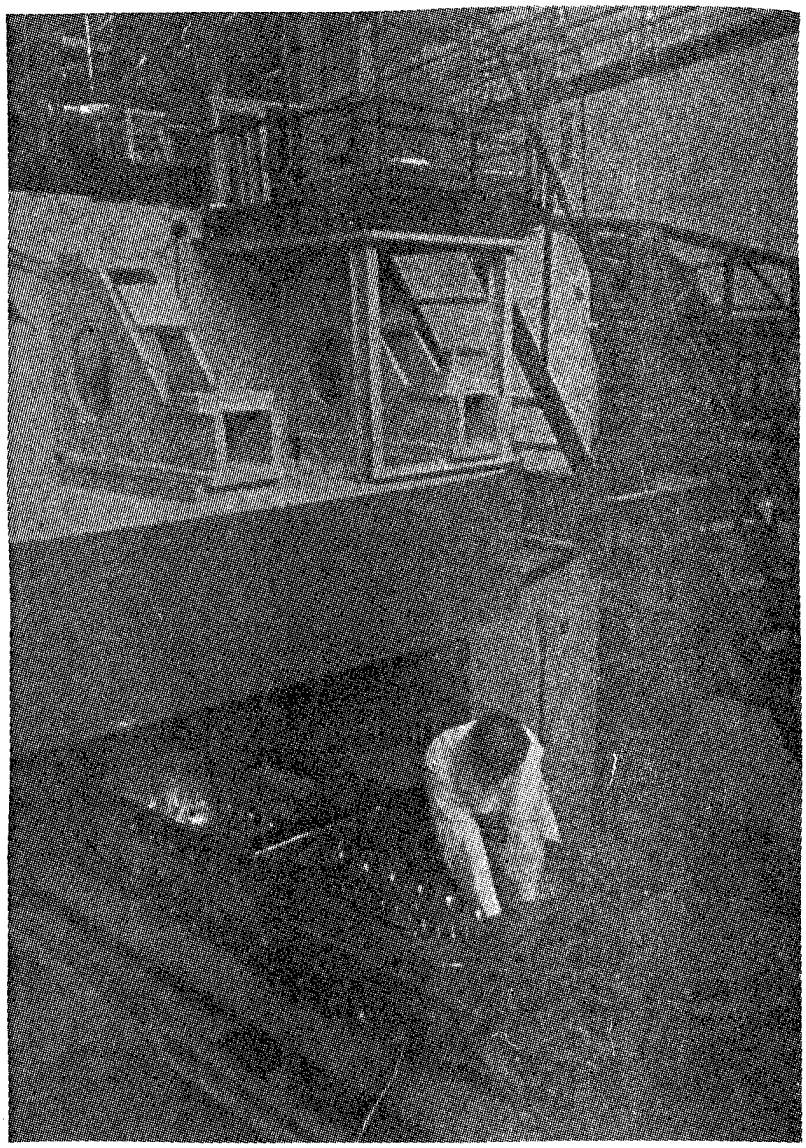
I am a member of the second generation Bulgarian scientists who have worked at Dubna. As a student and a very beginning physicist I had the opportunity to learn from our previous envoys there, in such a way that, on my arrival at Dubna in 1971, I did not find myself in an alien place and starting from zero. Thanks to the excellent attitude of the collective of the theoretical physics laboratory, where I was welcomed without reservations, both the institute and Dubna became close to me and their fate became my fate.

Within a short time my scientific outlook broadened imperceptively and incredibly. The very atmosphere at the laboratory encourages persistent work. No one comes to see you to chat or simply to kill time. Everyone is working with the ambition of creating something new, interesting and exciting. One is greatly impressed by the seriousness and high professionalism of the Soviet scientists (in most cases, actually, this is not achieved in our country): fluent knowledge of the foundations of science and profound and most thorough familiarity with all aspects of a narrow field of specialization. Professionalism runs through all levels of the joint institute, from the specialist foreman in scientific equipment to the greatest scientist. Such a collective is an ideal place for the development of a young scientist.

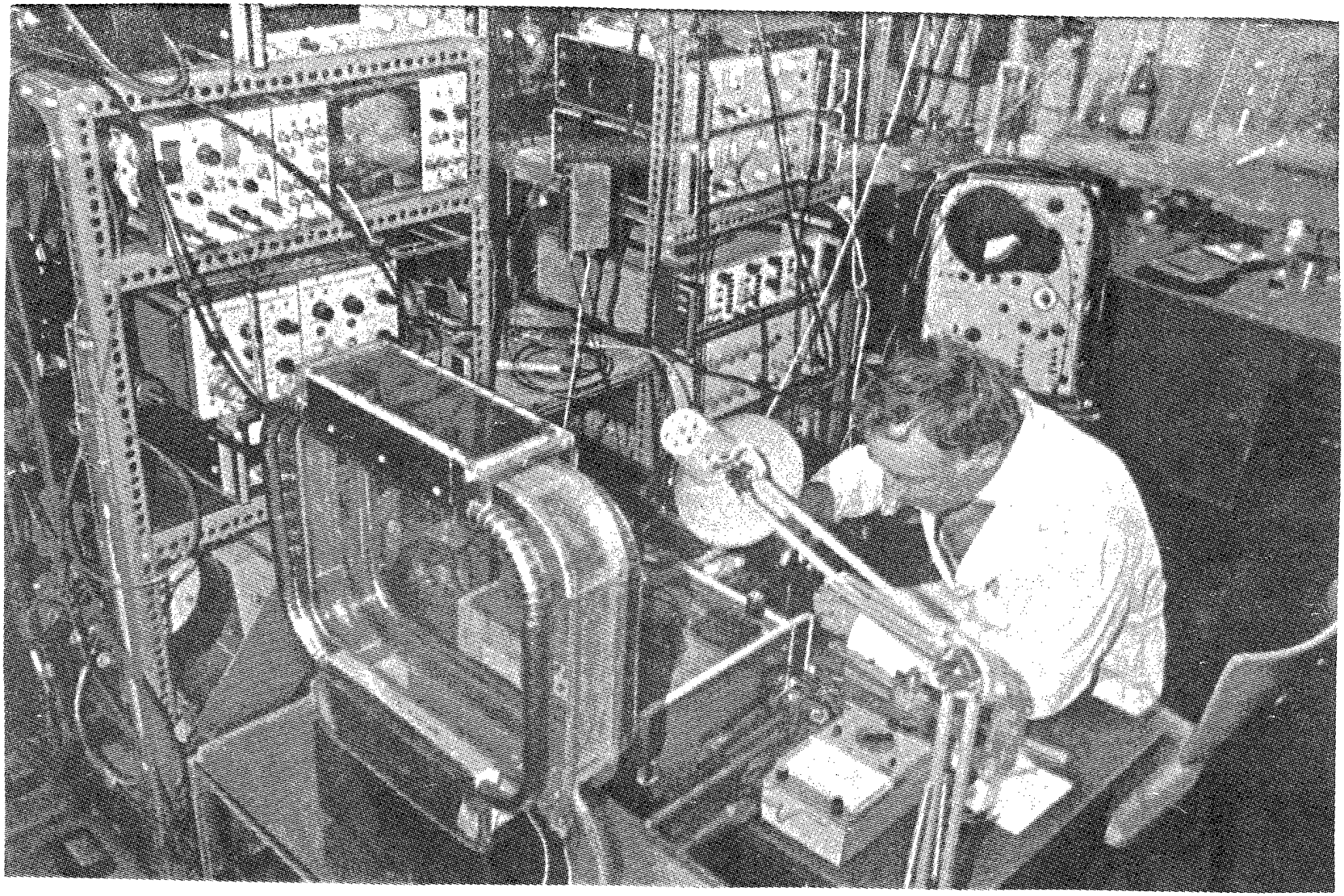
In my case, work at the laboratory was happily related to my friendship with Professor Vladimir Kadishevskiy, with whom I undertook to work. He was both my teacher in science and my closest friend. That is why everything came to me easily and imperceptively. Joint scientific creativity, which involves profound emotional experiences, demands total spiritual synchronizing and predisposition for friendship. However, frequently, somehow the ties begin to break and the scientific collective with its good feelings breaks down. Luckily this did not take place in our case: for the past 19 years we have been together in science and life.



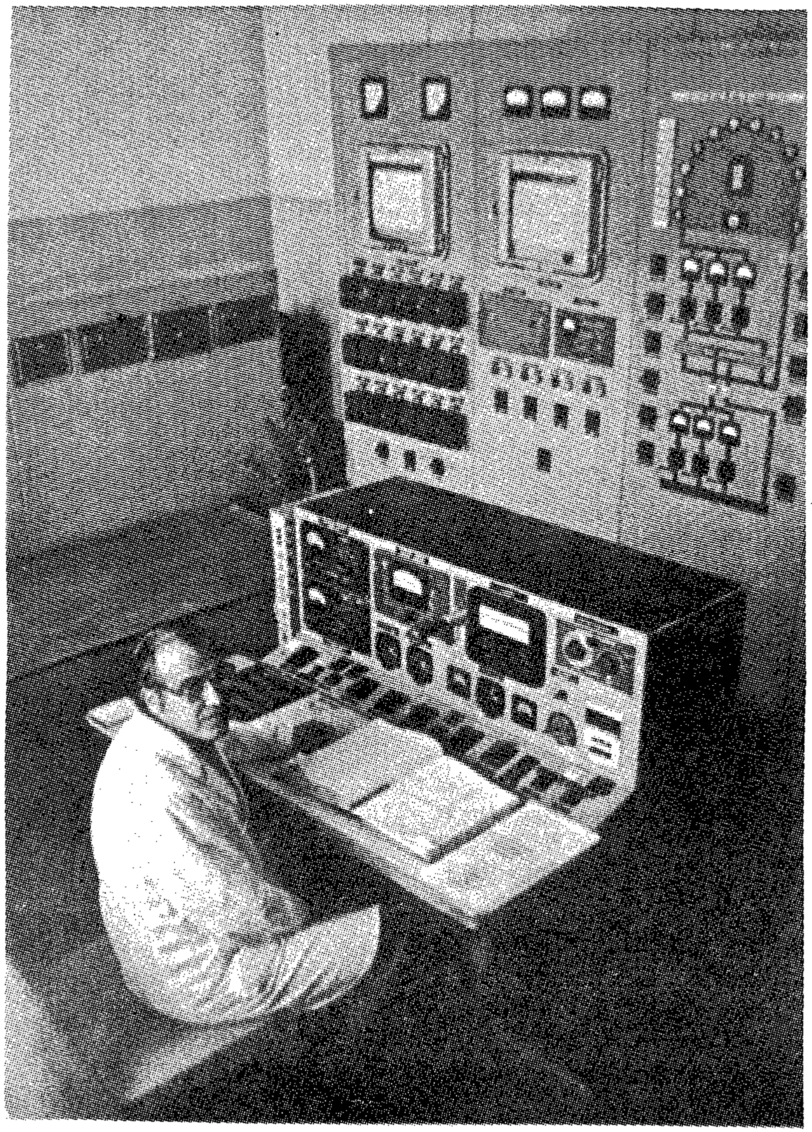
Spectrometer used in the search for charm particles



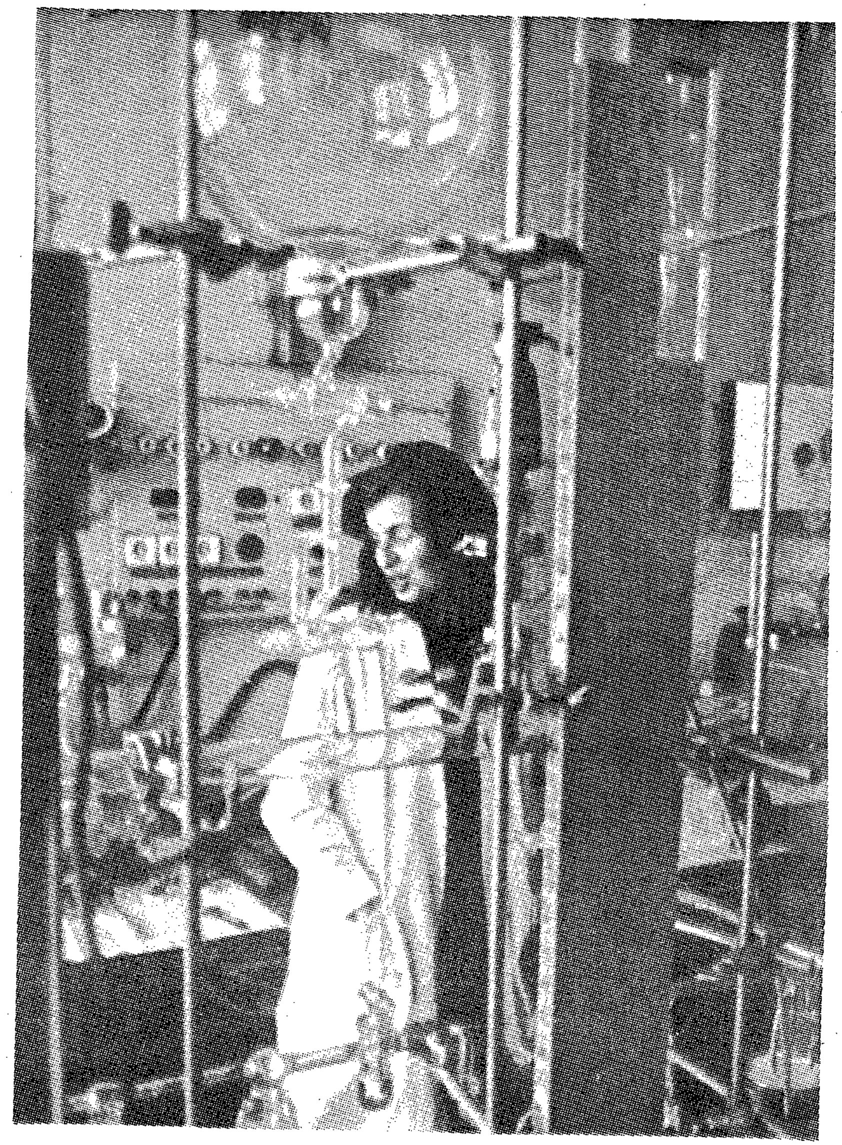
Piece of equipment used by nuclear physicists: the two-meter "Lyudmila" hydrogen bubble chamber



Institute for Nuclear Research and Power Industry, "neutron and reactor physics" sector--measuring laboratory



At the control hall of the nuclear reactor in Sofia



The Institute for Nuclear Research and Nuclear Power Industry is already engaged in radiocarbon dating

BULGARIA

THEFTS OF MATERIALS AT KOZLODUY NUCLEAR UNITS REPORTED

Sofia NARODEN STRAZH in Bulgarian 30 Apr 86 pp 1,2

[Article by Stoyko Stoykov: "A Constellation on the Banks of the Danube: The Kozloduy Nuclear Power Complex"]

[Text] Among the highest structures erected by the heroic construction workers of our socialist homeland stands our national pride, the Kozloduy nuclear power complex.

In 1974 construction began on the fiery constellation of the 4 power generating units making Bulgaria one of the 19 countries in the world which use nuclear fuel for peaceful purposes. But the Bulgarian Communist Party and its central committee did not remain satisfied with the initial success, and so the Kozloduy First Nuclear Electric Power Plant, now the Nuclear Power Complex, was transformed into an impressive construction site. The first 1000-megawatt power generating units to be built outside the USSR, the 5th and 6th such units, are being assembled during the current party congress year.

Some days before May Day we interviewed one of the directors of the complex, Tsvetan Tsvetanov, director of operation and security, to learn more about the success of our personnel in the campaign to make certain of exemplary public order at the facility.

"The first 4 power generating units last year produced 13.13 billion kilowatt-hours of electric energy," he informed us, a note of pride in his voice, "and we hold first place among the CEMA member countries in volume of generating unit capacity (1,760 megawatts). Currently the efforts of our international labor collective, which in addition to Bulgarians and Russians includes Vietnamese, Poles, Hungarians, Serbs, Cubans, and Nicaraguans, are being applied toward construction of our first 1000-megawatt reactors, which have costly equipment and a large number of the latest computers. The fifth power generating unit is to be commissioned in the near future, and intensive work is in progress on the sixth unit, which should begin operation in mid-1988."

Our conversation, which is then joined by Lieutenant Colonel Vasil Lukanov, VM [Departmental Militia] commander at the complex, imperceptibly shifts to our main topic, security at the complex.

Reliable Protection

"During the current congress year, as in the past, we must not allow gross violation of public order in the operational part of the complex," pointed out the commander of the Departmental Militia, which has responsibility for guarding and securing the facility. "We have also taken the necessary steps to protect the fifth and sixth generating units. What is more, we can claim success in this area, as a result of the constantly growing sense of personal responsibility among militiamen in performing patrol and guard duty. In particular, we can claim a heightened spirit of competition among the posted guards, squads, and platoons. This spirit has been transformed into a collective guarantee of security and exemplary public order. The security alarm equipment, the pass system, and the comprehensive physical protection measures are all strictly in accordance with regulatory documents."

At this point Lieutenant Colonel Lukanov recapitulates the results of socialist competition over the 1st quarter of the year, the watchword of which was worthy commemoration of the 13th Party Congress and prompt and precise implementation of its historic resolutions.

At midnight, while on guard duty at post No 6, Sergeant Mladen Mladenov heard calls for help. An arrogant violator of public order in an inebriated condition had assaulted a helpless woman. The guard immediately went to her assistance. The malefactor tried a judo attack on him, but this did not deter the brave Komsomol member. An active member of an emergency squad, he demonstrated his high professional skill in practice and displayed respect for the assailant.

Alarms alerting to forcible entry and plundering of trucks situated in the outlying areas of the construction site were becoming more frequent. Money, expensive tools, and other property belonging to workers were disappearing. There were not enough security forces to cover the extremely large area. What could be done? This question was discussed first in the Komsomol organization and then in the primary party organization with the secretary, Valeri Nankov. A decision was made spontaneously. In honor of the 13th Congress of the BKP, each member of the militia was to serve on 13 additional details during his off-duty hours. A group of volunteers served on a detail every night to assist the duty platoon. Results were soon forthcoming. On one of the immediately following nights, when the first platoon under Captain Tomov and an auxiliary group from the third platoon under Lieutenant Barchev were on duty, an alarm was given to indicate that a truck had been broken into. Through prompt and coordinated action, the duty units succeeded in apprehending the perpetrator, a cattle breeder from the nearby village of Butan, who had perpetrated dozens of burglaries.

Late one evening, while inspecting guard posts, Senior Sergeant Kini Gornishki encountered a tractor pulling a trailer on a restricted service road. It was coming from another area, but he nevertheless decided to inspect it. He found that the trailer contained stolen pipes, boards, and other construction materials.

In the middle of one night, Senior Sergeants Marin Vulchev and Ivan Zakhariev Zakhariev decided to inspect the guard posts in the construction site area. In the northern part of the site they heard the sound of a tractor engine

running. They headed in that direction, on their arrival observing two persons loading concrete reinforcing iron into a trailer. Yet another theft was prevented.

During the first three months of the year, Sergeant Tsvetan Khinovski sounded nine alarms alerting to attempts to take construction materials away from the area of the complex, thereby outstripping his superior, Senior Sergeant Dragan Dimitrov and taking first place on his shift. Senior Sergeants Valeri Vulchev, Ivan Kostovski, Luchezar Stoyanov, Petko Petkov, and dozens of other young militiamen are in leading positions in the socialist competition.

"The success of the younger and newer personnel, which has moved our second platoon into first place in the socialist competition, can be credited exclusively to the energetic work done by squad leaders Senior Sergeant Marin Vulchev, who has been given a rating of excellent by the Ministry of Internal Affairs, and Todor Shulev, and by senior personnel Stefan Kirov, Vasil Vulkov, Ivanka Dokova, and Dragan Dimitrov," stated the platoon leader, Captain Stefan Simeonov. "We have overtaken last year's first-place unit, Lieutenant Lyuben Barchev's platoon, in two of the basic categories, detection and prevention of criminal acts. The platoon commanded by Captain Emanuil Tomov is in third place."

A number of interviews with former first-place units convince us that the competitive struggle has continued from the first days of the second quarter. This is to be seen from the example and the work of younger personnel such as Senior Sergeant Zdravko Aleksandrov, Luchezar Stoyanov, Yavor Nikolov, and others, who perform their duties with a high sense of responsibility.

Our talks were accompanied, by the way, by an interesting "excursion" from the area of the active part of the complex, around the construction site and beyond, to the buildings of the fifth generating unit itself under construction. This gave us an opportunity to meet some of the militiamen posted in the most vulnerable areas where costly computer equipment is installed, the patrol guards, and some of the distinguished construction and assembly workers, such as hero of socialist labor and Dimitrov Prize winner Ivan Lichev.

"My work brigade, which has nearly 300 young people in it, has given its word that it will complete the sealed portion of the fifth reactor now under construction by the end of June," he told us. "This is an arduous task, but completing it will cut in half the time required for finishing the power generating units."

Even more exciting was our meeting with twice hero of socialist labor Gospodin Yordanov, leader of the famous Yu. Gagarin youth construction brigade and recipient of the gold Order of Labor and of the Order of the Red Banner of Labor.

"The members of my brigade are now at work at elevation mark 36 of the fifth generating unit," he says. It was necessary to install equipment of large dimensions to prepare the reactor for flushing, in advance of the 13th Congress. The work was completed ahead of schedule. The next most urgent task is to prepare the reactor for starting regular operation by the end of the year. Then we will start on assembly of the sixth generating unit."

An indelible impression of the young builders of Bulgaria in April stayed with us when we left the construction site. The intermingled sounds of Bulgarian and foreign languages in conversation continued to sound in our ears. The second new 1000-megawatt unit will soon be added to the fiery constellation of nuclear reactors on the banks of the Danube, and the flow of light, heat, and energy into our enterprises and homes will become even stronger.

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BULGARIA

CONSTRUCTION ACTIVITIES AT BELENE FACE MANPOWER SHORTAGE

Sofia TRUDOVO DELO in Bulgarian 25 Apr 86 p 1

[Article by Major Vasil Tsvetanov and Lieutenant Atanas Levchev: "The Belene Nuclear Power Plant: Construction Picks Up Speed"]

[Text] The nuclear power plant at Belene will consist of 4 power generating units. Around 1600 specialists are needed for operation of the 1000-megawatt unit alone.

At the present time, 6 construction and assembly organizations are working at the facility. Their number will soon increase to 11.

Capital investment in the amount of 2.228 billion leva will be applied during the 9th Five-Year Plan, and construction and assembly work costing 867 million leva will be carried out.

The number of construction and assembly workers must reach 15,000 by the year 1990.

Part of the construction and assembly work will be done by Construction Corps troops, which in 1986 alone will deliver 4 component facilities representing a total cost of several million leva.

As in the case of every major new construction project, many problems naturally remain to be solved. Engineer preparation of the site is 2 years behind schedule, as are also building of industrial engineering facilities and housing construction, etc. Procurement of the skilled manpower needed is another serious problem.

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BRAZIL

CHERNOBYL INCIDENT TO PROVOKE CLOSER SCRUTINY OF PROGRAM

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 30 Apr 86 p 3

[Editorial: "The Nuclear Disaster in Kiev"]

[Text] If the United States were governed by a single party, which used the CIA as its "long arm" for motivating the simpletons in the Propaganda and Agitation Department (the traditional "agitprop" everyone knows about), we would now be seeing a large-scale and spirited ecological and antimilitaristic campaign directed against the Soviet Union and waged throughout the free world in order to protest against the nuclear accident in the Kiev region and demand the destruction of all nuclear arsenals on the face of the earth. Since the United States, fortunately, is a country where the parties take turns holding power and where the CIA is subordinate to Congress and does not back idiots to spearhead pro-American campaigns, the world ought to take advantage of this occasion to reflect more deeply on the problem, starting with the following question: Don't this incident and the others that occurred previously justify, in themselves, a restudy of the issue of the use of nuclear energy for both peaceful and military purposes?

It is unlikely that the true scope of the disaster caused by a failure at the Chernobyl nuclear power station--the damage to human life and to the ecology--will ever be known. Luckily for the peace of the population of neighboring countries, the radioactive clouds that reached them did not, initially, contain lethal indices of radioactivity. That fact doesn't stop speculation as to the seriousness of the accident--on the contrary, it even stimulates judgments, whether hasty or not, since the fact that radioactivity at near-alarm levels was detected in Sweden shows that something "serious" happened, to quote an advisor to Ronald Reagan.

Another aspect that attests to the extent of the calamity that profoundly affects the Russian people is the publicity given it by the Soviet government. If the disaster were small-scale, the most absolute silence would reign and Moscow would do no more than send a confidential diplomatic note to the countries affected by the radioactive clouds. Today, not only did TASS give an account of the accident--taking care to state that 2,300 had already occurred in the United States!--but it is known that an extensive area around the reactors was declared a "safety zone." Residents must have been evacuated in haste and, although it is very difficult to know how many victims there

were, certainly there is a great number of them when we consider both those who suffered a lethal impact at the moment of the accident and those who will have to live for years with the prospect of genetic mutations or effects that are less serious for their progeny but perhaps more harrowing for themselves.

The nuclear industry certainly can be included in that part of the Soviet society and economy that Castoriades calls "military," that which has the most advanced technology and the best-trained and most well-paid workers. The accident at Chernobyl, even if due to human failure, certainly would not be due to inadequacies in the professional qualifications of the specialists that were running the electric power generating station. When one keeps this fact in mind and remembers other accidents, such as the one at Three Mile Island (which did not attain these proportions), one sees that the discussion about the utility of building nuclear-powered generating stations is not completely senseless. We feel completely comfortable in bringing up this controversial issue because we stand neither with those who see the atom as the greatest ill to ever befall humanity, nor with those who make defense of the environment at any price into a tool in the political struggle against the Western world in general and the United States in particular.

Actually there is no way to avoid saying that the risk that a nuclear power plant poses to neighboring population centers and even for distant regions is enormous--much greater, we would say, than that represented by a dam of the size of Aswan or Itaipu. Not only the problem of the risk posed by a disaster will become a topic of renewed discussion after the accident in the Soviet Union; the economic feasibility of the project and the damage that nuclear power plants may do to the environment will also be debated again. In normal operation, the reactors are almost as "clean" as a hydroelectric power plant, but there is a point at which they become a nightmare: how to get rid of the atomic waste? That problem has not yet been solved, despite all the efforts and the vast sums of money that Western governments and even the Soviets have allocated to it. And what can one say about what goes on in developing nations?

The Chernobyl accident does not solve the problems faced by countries of the industrialized world or developing countries that opt to produce electrical power by using nuclear energy; on the contrary, it only makes the search for solutions for those countries more distressing. The issues that will be raised from now on are of direct interest to Brazil. We are sure that the accident in the Kiev area will put the Geisel administration's nuclear plan on the agenda once again and will also raise the question or the training and technical qualifications of those who will be responsible for that plan in terms of the day-to-day operation of each plant, if and when they are actually completed. Not to forget Angra I, a striking example of the irresponsibility of an entire era of government and of imperfections that are inconceivable in a modern technological undertaking.

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BRAZIL

SARNEY ESTABLISHES WORK GROUP TO EXAMINE PLANT SAFETY

Special Attention to Angra I

Rio de Janeiro O GLOBO in Portuguese 3 May 86, p 14

[Text] Brasilia--President Jose Sarney yesterday ordered Aureliano Chaves, minister of mines and energy, to immediately set up a working group to examine safety conditions at Brazilian nuclear plants and, if necessary, to suggest measures to improve their supervision. In his memorandum to the minister, Sarney stated that he is concerned about the accidents that have occurred at nuclear reactors in other countries.

Acting promptly yesterday, Minister Aureliano Chaves instructed the presidents of Eletrobras, Mario Bhering, and of Nuclebras, Licinio Seabra, to immediately conduct an evaluation of Brazilian nuclear power plants, especially Angra I, which is now functioning. The recommendation calls for a complete and detailed examination of safety rules observed in the construction and operation of the nuclear reactors.

Minister Chaves said that President Sarney had expressed concern about the nuclear accident at the Chernobyl reactor in the Soviet Union and its possible effects on Brazil. On that basis, Chaves asked Rex Nazare Alves, president of the National Nuclear Energy Commission (CNEN) to send him a report on the potential impact of the accident within Brazilian territory.

Chaves believes that every possible caution is already being taken in the installation of the Angra I nuclear plant, but recommends a more thorough evaluation of the situation. He said that special attention should be given to protecting the residents and the environment in the municipality of Angra dos Reis, which is located in the vicinity of the facility.

Full Disclosure Promised

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 6 May 86 p 7

[Text] Physicists Jose Goldemberg, rector of the University of Sao Paulo and Luis Pinguelli Rosa, of the Federal University of Rio de Janeiro, will be members of the special commission created by order of President Jose Sarney

to evaluate the safety rules that apply to the construction and operation of nuclear reactors for the protection of the Brazilian population and environment. The commission will hold its first meeting at 10:30 am tomorrow in the office of Aureliano Chaves, minister of mines and energy.

The two physicists have been the most vocal critics of the Brazilian nuclear program. They want establishment of a policy on storage of nuclear waste and urge that construction on nuclear power plants at Angra dos Reis be stopped. One power plant--Angra I--is already operating in that Rio de Janeiro municipality and two more units are being built there--the first two under the Brazilian-West German agreement.

Other members of the special commission will be the presidents of the National Nuclear Energy Commission, Rex Nazare Alves; of Nuclebras, Licinio Seabra; of Eletrobras, Mario Bhering; and of Furnas Electrical Power, Camilo Penna; as well as the ministry's advisor for environmental affairs, Ben-Hur Batalha and representatives of Itamaraty, the National Security Council, and the Ministry of Environmental Affairs and Urban Development. "We do not want to hide anything," said Chaves, adding that his main objective is to provide the country full information.

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BRAZIL

GOVERNMENT TO MAINTAIN PROGRAM; CNEN OFFICIAL ON ANGRA SAFETY

Energy Needs Take Precedence

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 4 May 86 p 14

[Text] The Brazilian nuclear program need not undergo changes as a result of the accident at the Chernobyl atomic plant in the Soviet Union, according to a statement by Ronaldo Fabricio, director of NUCLEBRAS and president of NUCLEN-NUCLEBRAS Engineering, although he admitted that it has had a very negative effect on public opinion, and has provided opponents of the nuclear program with an opportunity to demonstrate vociferously.

Ronaldo Fabricio, however, does not take the emotional interpretation of the event seriously, and says that Soviet graphite reactors cannot be compared to Western PWR or "light water" reactors. The fundamental difference is that Soviet reactors do not have the containment tank that seals in radioactivity in case of an accident, not permitting it to escape into the atmosphere. The containment tank consists of a 3.5-centimeter layer of steel and a 60-centimeter concrete wrapping, as is the case with the Brazilian reactors.

Ronaldo Fabricio explained that little is known of what occurred in the Soviet Union, although in the Three Mile Island accident we were informed every 2 hours of the disaster's progress. Based on that information, we were able to adopt modifications that greatly improved the safety of the Angra 2 and Angra 3 reactors. He also does not accept the argument that Brazil will not actually need nuclear power until the year 2015, asserting that a nuclear plant takes from 10 to 12 years to build and that, if the basic industry is not constructed and the technical capacity not developed by the time the country's hydroelectric power is exhausted, "we will have to import those items."

He emphasized that the revisions in the nuclear program proposed by the commission appointed by President Sarney are still going to be some time in implementing, because they depend on other institutional measures. Ronaldo Fabricio agrees, however, with the commission's recommendation that NUCLEBRAS remain involved solely in the field of the fuel cycle (enrichment and mining), leaving to ELECTROBRAS the responsibility for constructing nuclear plants, and thus absorbing NUCLEN-NUCLEBRAS Engineering.

Background

The German-Brazilian nuclear program begun in 1974 by the Geisel government has already spent $7 billion, $4 billion in investments and $3 billion in financial charges. It needs $3.78 billion more to continue present work on the Angra 2 and 3 plants and the demonstration plant for the uranium enrichment process. In the event that President Sarney decides, on the commission's recommendation, to construct yet another nuclear plant, an additional $4 billion would be needed.

The absorption of sensitive fuel cycle technology that was the fundamental point of the agreement between Brazil and Germany has not taken place in these 12 years, and has forced Brazil to look for other technological alternatives in what has been called the parallel nuclear program: the development of the CTA-Aerospace Technology Center, and the IPEN in Sao Paulo.

For that reason, the commission decided to delay investment in the German enrichment process for 3 years, in order to evaluate the different enrichment processes and base a decision on eventual industrial investments on the process which shows itself to be the most promising.

The commission's report, in other words, has demonstrated that there is no reason whatsoever to justify the agreement between the two countries with regard to enrichment technology and uranium reprocessing. The discussions now are based only on the construction of nuclear reactors in anticipation of future energy demand, when the country's hydroelectric potential is exhausted.

Emergency Measures Outlined

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 30 April 86 p 7

[Text] An accident like that which occurred in the Soviet Union would be impossible here in Brazil due to characteristics of Russian nuclear plants that do not provide the protection and safety conditions of the Admiral Alvaro Alberto nuclear center in Angra dos Reis, according to a statement provided yesterday in Rio by the director of the Reactors Division of the National Commission for Nuclear Energy, Jose Salvatori.

Salvatori also explained that it would be very difficult for the cloud of radioactivity from the Soviet Union to travel to Brazil, because the wind currents in the highest layers of the atmosphere in the northern hemisphere circulate independently of ours. In any case, he said that the institute of Radioprotection and Dosimetry normally makes rainwater analyses and any abnormality would be detected.

According to Salvatori, in case of an accident in the Admiral Alvaro Alberto nuclear center, the first measures would be taken by Furnas Central Electric, putting into action the emergency plan elaborated in accord with the international norms of the International Atomic Energy Agency. Those emergency plans include collaboration with the civil defense that, besides

the military police and the fire departments, could also call into action the army, navy and air force, if necessary.

In case the accident cannot be immediately controlled, the emergency plan provides for evacuation of the population in the vicinity of the reactors. In order to assist people affected by radioactivity, the emergency plan would draw upon the resources of the Mambucada Hospital of Nuclear Medicine and the Marcilio Dias Naval Hospital in Rio de Janeiro, according to Jose Salvatori.

Furnas Central Electric stated yesterday that in case of an accident its responsibility covers a circle 1 kilometer in diameter around the reactor, including Praia de Itaorna and Praia Brava, where the reactors and their operators are located. Should the effects of the accident spread beyond that operational area, the SIPRON, or Nuclear Protection System, an organ of the Ministry of the Interior, would come into effect.

SIPRON is a group composed of representatives of the civil defense, the National Commission for Nuclear Energy, the navy, the army and the air force. After the population has been evacuated, transport of the wounded, in case of serious accident, and other measures are the responsibility of SIPRON, according to the Furnas report.

Furnas also explained that the Angra I nuclear plant underwent a meticulous inspection last August by AIEA technicians based in Vienna, and that the findings, extremely favorable to Furnas, affirmed that "the Angra I plant surpasses international safety standards, and currently presents minimum risk in operational conditions."

The Angra I plant underwent a reformulation of its original plans and was adapted to provide better safety conditions, as a result of an accident which occurred at a similar plant of the same Westinghouse model, in Ringhals, Sweden. All the nuclear plants of that type had to undergo repairs and modifications in the steam generation system. The Angra I plant is temporarily shut down for maintenance, recharging of fuel, and replacement of the refrigeration tubing system by a new one with a metallic connection of a titanium base, in order to prevent the salt water corrosion that has caused some problems, including small leaks, in the recent past. The other two systems, Angra II and Angra III, are still under construction, and should be ready by 1992.

The Angra II and Angra III plants are considered modern and safe by international standards. Like Angra I, the system that has been adopted is the PWR--Pressurized Water Reactor--in which the whole radioactive system, including the nucleus in which the uranium is fissioned as well as the boiling, radioactive water, is prevented from contact with the external envirnoment by means of strong steel armoring. The Angra I plant has already produced 4,397,440 megawatt-hours since it began functioning. Its capacity utilization has been 60 percent of the 626,000 nominal kilowatts. Angra II and Angra III will have twice the capacity of Angra I, or 1.2 million kilowatts.

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BRAZIL

PHYSICIST CRITICIZES ANGRA I CIVIL DEFENSE PLAN

PY311245 Sao Paulo O ESTADO DE SAO PAULO in Portuguese 29 May 86 p 27

[Text] Nuclear physicist Luis Pinguelli Rosa, a professor at the COPPE-UFRJ [Coordination Office for Engineering Post-Graduate Programs of the Rio de Janeiro Federal University], last night said during a debate held at the Rio de Janeiro Engineering Club that it took Brazil 15 years to build the Angra I nuclear plant and that, therefore, it could wait a few more days to reconnect its reactor, "since the civil defense office lacks a civil emergency plan to safeguard the Angra dos Reis population and since the Chernobyl nuclear accident showed the need to evacuate over 90,000 people within 20 days from an area 30 km in radius."

Pinguelli Rosa showed that the Angra civil evacuation plan provided for the evacuation of people within a radius of only 15 km in 15 days. He noted that the nuclear defense system, SIPRON, was inherited from the authoritarian regime, the kind that stood by the rule: "The government has spoken, there is nothing further to add, and anyone who disagrees with this may be charged with being against the nuclear program." He added that the SIPRON program even provides for crimes against the nuclear program, but that it does not provide for the safety of the people.

Tito Alberto Gobato, an engineer at the Civil Defense Secretariat, has noted that it is not within the competence of the Civil Defense Secretariat to say whether or not the safety program is good, but that it must comply with what is established by the National Commission for Nuclear Energy, CNEN. He added: "It is absurd that until a few days ago we had an emergency and evacuation plan that was confidential and that only a few people knew of its existence."

Jose Mendoca de Lima, the person in charge of approving the Angra I plant reactors for the CNEN, also admitted that the civil emergency plan was not known by the people. Ayrton Cauby da Silva, the engineer responsible for the proper functioning of the Angra I reactor, explained that the Furnas Sao Paulo Electric Power plants company is legally responsible for any damage caused by a nuclear accident. According to Da Silve, the Furnas Company has had an emergency plan since 1980, but that this was not known by the population.

Nuclear physicist Pinguelli Rosa added that it was wrong to say that the Chernobyl nuclear plant accident was due to the inadequacy of Soviet nuclear technology and that graphite fires are very rare. He added, however, that "even the most unforeseen hypothesis can occur and the Brazilian Government has an enormous responsibility, because without the need for nuclear energy it is subjecting the Brazilian people to a tremendous risk without consulting them."

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BRAZIL

BRIEFS

NUCLEAR SUBMARINE CONSTRUCTION--The minister of the Navy, Admiral Henrique Saboia, said yesterday in Rio that plans for the construction of three submarines in Brazil are perfectly viable and the NUCLEP, a subsidiary of NUCLEBRAS, will participate in the construction of the IKL 1400 class battleships, similar to the one already under construction in West Germany. The minister spoke on naval rearmament after ceremonies at the old naval headquarters, where Admiral Hugo Stoffell assumed the position of director general of materiel, receiving the title from Admiral Mario Hermes, who tomorrow will assume command of naval operations. "NUCLEP has an industrial capacity that permits participation in submarine construction, and is appropriately located to carry out this work," said the minister, who expects "to soon sign the contract with the enterprise that was recently pointed out as one of the state-owned enterprises that could be closed down." NUCLEP currently has excess capacity of above 60 percent. The first submarine of the naval rearmament is under construction in Kiel, West Germany, at HDW shipyards. The hulls of the three that will be constructed at the Navy arsenal of Rio will remain the responsibility of NUCLEP, in accordance with Minister Saboia's philosophy of not making complementary investments in the Navy for production of naval materiel when there is sufficient capacity in private industry or in the state-owned enterprises. In his speech, Adm. Mario Hermes gave special emphasis to "plans for the construction of a prototype conventional submarine, the SNAC-1, currently in the conceptual phase." [Text] [Sao Paulo O ESTADO DE SAO PAULO in Portuguese 1 May 86 p 5] 13026/9435

CSO: 5100/2068

PERU

IPEN GIVES DETAILS ON HUARANGAL NUCLEAR RESEARCH CENTER

Reactor Safety Features

Lima EL COMERCIO in Spanish 3 May 86 p A-11

[Text] The 10-thermal megawatt reactor that will begin operating next year at the Huarangal Nuclear Research Center (in Puente Piedra) will present no danger at all to the capital, the president of the IPEN [Peruvian Nuclear Energy Institute], the engineer Guillermo Florez Pinedo, assured yesterday.

At the same time he once again stated that the radioactive cloud coming from the Chernobyl nuclear power plant in the Soviet Union should not reach Peru's skies. Even if that should occur, though, it would come through the stratosphere in almost undetectable quantities, the IPEN specialists reported.

It should be pointed out that such emissions of radioactive substances would have to travel almost 15,000 kilometers through a variety of atmospheric phenomena (rain, high and low temperatures, winds, etc) before reaching Peruvian latitudes, indicated the engineer Jose Arenas Carrasco, a nuclear safety and radiological protection specialist at the IPEN.

The engineer David del Alcazar, head of the Huarangal project, reported that the Huarangal reactor's container, which is 30 meters high and 32 meters in diameter, is extremely safe. "It has been designed to withstand an earthquake of level 10 intensity; 8,000 tons of concrete and 1,700 tons of steel were used in its construction," he indicated.

The accident in the Ukraine bears no similarity to the explosion of the atom bomb in Hiroshima, according to the IPEN experts. The Hiroshima bomb was a nuclear fission reaction which released heat and produced a mechanical expansion; these factors killed hundreds of thousands of people.

Even though there is an almost total news blackout about what really happened in Kiev, it is presumed that the graphite which is part of the reactor is continuing to heat up, causing a series of fires with temperatures over 5,000 degrees C, and with a huge amount of radiation around the core.

The IPEN is remaining in constant contact with the IAEA [International Atomic Energy Agency], headquartered in Vienna, in order to obtain official reports on what is really happening, so it can evaluate the accident's magnitude, said Mr Florez Pinedo.

In closing, he indicated that winds in the northern hemisphere maintain an almost constant direction and do not travel down toward the southern hemisphere. This suggests that the radioactive cloud will not drift toward these latitudes.

Radioisotope Production in 1987

Lima EL COMERCIO in Spanish 4 May 86 p A-7

[Text] In June 1987 the Nuclear Research Center of Peru, located in Huarangal, will begin to produce radioisotopes for practical applications, primarily in the fields of food supplies and health care.

The huge 10-MW nuclear reactor is now being installed in a container 30 meters high whose structure can withstand enormous stresses, including a level 10 earthquake. That is an extremely strong earthquake which would leave all of Lima practically decimated if it should actually occur.

The Huarangal center, about 30 kilometers from Lima, has a number of specialized buildings which will be used for low-power operations. Initially, the center's main activity will be the production of radioisotopes, the president of the IPEN, engineer Guillermo Florez Pinedo, reported yesterday during a guided tour of the site.

The reactor, provided by Argentina, is 11 meters high and 4 meters in diameter. It is made of stainless steel; its center houses the core, composed of fuel rods made of uranium and other zircaloy rods which are used as moderators to cool the core.

This reactor will be used for the production of radioisotopes, for training highly specialized personnel, for nuclear technology education in various fields of science, and it will also serve as a research and experimental tool for both public and private institutions.

Ample Facilities

The auxiliary buildings include electronics labs, neutrography facilities, radiochemistry labs, reactor physics labs, experimental physics labs, activation analysis labs, reactor chemistry labs and other related labs, shops, and support systems.

Along with the reactor, the radioisotope production plant is also being built. It will have a complex of facilities for the production of radioisotopes and tracer compounds, including additional facilities for training and labs for developmental work.

The facilities of the National Radiological Protection and Medical Services Center are located in a separate building. Its activities will gradually take on a national scope, in order to protect both operators and users.

The facilities for other services are also being installed at this time. These services include: supervision and control of the use of radioactive materials, personnel dosimetry, environmental monitoring and control, radiation protection medicine and radiotoxicology, calibration of radioprotective equipment, users advice and consultation services, conventional medical services, radioactive waste management, as well as facilities for radiological protection and nuclear safety training.

In order to obtain the meteorological data needed for environmental studies, such as wind direction, speed and temperature, atmospheric moisture and pressure, a meteorological tower 10 meters high is to be installed.

This nuclear center is the result of cooperation with the Argentine government. A contract was signed between the IPEN and Argentina's National Atomic Energy Commission, as well as a financial agreement between the National Development Bank of Argentina and the Bank of the Nation of Peru.

The Staff is Ready

Engineer Florez Pinedo said that for several years the IPEN has been preparing personnel who will operate the Huarangal nuclear center.

Later, this staff may take over the future irradiation plant, which will be of great practical value in the fields of food supplies and health care.

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EGYPT

COMMITTEE EASES STATE OF EMERGENCY

Cairo THE EGYPTIAN GAZETTE in English 23 May 86 p 2

[Text]

THE Emergency Nuclear Radiation Committee, headed by the Minister of Energy, Mr. Maher Abaza, yesterday stressed the return of natural life to Europe and all countries of the world after the disappearance of the nuclear cloud from the USSR, saying that there were no hazards of radiation either in Egypt or the Middle East.

The committee stressed that Egypt was not exposed to any nuclear radiation during the last 27 days following the explosion of the Russian nuclear reactor.

The committee also decided to permit travel to East Europe and the USSR which was prohibited during the last period, as the World Health Organisation (WHO) has informed Egypt of the possibility of travelling freely throughout the world. Threatening dagners and fears no longer exist, and exceptional measures adopted by a number of European countries, preventing travel were terminated, WHO report indicated.

The Committee also decided to stop all measures, of radio-active surveys and checks applied to planes, and ships arriving from these European countries or even passing through the local airspace or territorial waters as all examinations made to citizens or goods of the countries that were affected by radiation proved that all items and people are free from any impact of radiation.

The Minister of Energy, Mr. Maher Abaza, said that the state of emergency declared in Egypt following the Chernobyl blast will be gradually eased in Europe. He added that the committee will allow the importation of foodstuffs from Eroep provided that they will be subjected to the necessary nuclear radiation checks before being released and put for sale in markets. These food items include milk, dairy products, and fish. GSS

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CSO: 5100/4612

LONDON PAPER SAYS INDIA SHOPPING FOR NUCLEAR DEVICES

Bombay THE TIMES OF INDIA in English 10 May 86 p 9

[Article by K. N. Malik]

[Text]

INDIA'S attempt to buy from Sweden flash discharge X-ray machines, commonly known as industrial cameras and used to inspect welds and calibrate guns, is being interpreted here as proof that India is trying to develop nuclear weapons.

"The Financial Times" reported today that since such X-ray machines were used in designing nuclear weapons, western officials — they were neither named nor their nationality mentioned — believed that India was resuming development of nuclear weapons in response to Pakistan's attempt to acquire nuclear weapons.

The report said the Indian defence ministry first asked a British firm to supply the X-ray machines which it said were not manufactured by it, but that it could supply the machines after procuring from Sweden. The British firm probed the ministry of trade and industry for a possible export licence. It was told that the licence would not be granted.

Whitehall confirmed that it blocked the sale of this particular kind of machines. It, however, did not say whether it blocked the supply of the machines because of their potential use in designing nuclear weapons or because of India's extensive defence links with the Soviet Union.

The report quoted the managing director of Scandiflash, the Swedish firm which was approached by India for the machines, as categorically denying that such machines could be used for designing nuclear weapons.

The Indian high commissioner here Dr. P. C. Alexander, said the report was baseless. The former principal secretary to the Prime Minister said the Indian government policy was clearly not to go in for nuclear weaponry. This had been enunciated on several occasions. There was no change in the policy, he added.

Where was the question of resuming nuclear weapons development, Dr. Alexander asked. India had never made or tried to develop nuclear weapons in the past. It always held that its nuclear implosion in the mid-seventies was for peaceful uses of nuclear energy.

According to reports that first appeared in "The Economist" and subsequently in "The Financial Times", scientists at Britain's atomic weapons research establishment used flash discharge x-ray machines to measure how components move and change shape during a conventional explosion which precedes the nuclear reaction. The machine can take a series of pictures through metal at extremely short intervals.

According to the report, Scandiflash has so far not supplied the machines to India. The licence, it said, was kept pending till after Sweden had clinched the £ 730 million Indian army contract for artillery announced in March.

Scandiflash had sold these machines to Pakistan in 1982. These were being used by Pakistan on the country's secret nuclear weapons project.

The report also claimed that the Indians would carry out a nuclear test within two months of Pakistan testing a bomb.

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CSO: 5150/0108

INDIA

GANDHI MEETS WITH PANEL ON NUCLEAR POWER PROGRAM

Madras THE HINDU in English 10 May 86 p 6

[Text] NEW DELHI, May 9.

The Prime Minister, Mr. Rajiv Gandhi, has assured the Consultative Committee of members of Parliament attached to scientific departments that noaccident is possible at the Indian nuclear power stations as they have in-built safety features. He was speaking at a meeting of the committee last evening in the context of apprehensions created by the nuclear disaster at Chernobyl in the USSR.

To mitigate the consequences of an unlikely accident, Mr. Gandhi said a 1.6 km.-radius area around the plants had been demarcated as "exclusion area" and fenced. In addition, there was a sterilised zone beyond the exclusion area where development was controlled.

Radiation risk minimised: Members were informed that radioactivity releases from the power plant were minimised by double containment of the reactor consisting of a prestressed concrete, leak-tight reactor building enclosed in a reinforced cement concrete building. Other safety features were also explained.

They were told it was totally wrong to think nuclear power stations could explode like bombs. It was not physically possible for reactor fuel to agglomerate in a manner that could set off an uncontrolled nuclear chain reaction, they were informed.

Waste disposal: A nuclear power plant did not produce any significant quantity of radioactive waste, members were told. However, the spent fuel contained radioactive waste material and its management needed caution. Using available techniques, this was substantially reduced in volume and vitrified into a glass matrix of small volume, encapsulated in stainless steel and buried underground for long term storage. The first waste immobilisation plant had already been commissioned at Tarapur. Another at Trombay was scheduled for operation in 1990. The third plant to be set up at Kalpakkam was in the planning stage. This would have an in-built unit for handling wastes from fast breeder test reactors. It was expected to go into operation in 1993.

Members were informed that the total financial outlay for the nuclear power programme, including all activities from uranium mining to fuel fabrication, heavy water production, reactors, reprocessing and waste management was about Rs. 14,000 crores, based on the 1983 price level. The outlay for reactors alone constituted about 63 per cent, heavy water 22 per cent and other activities 15 per cent. The outlay during the 1990s would be about Rs. 1,000 crores a year.

Revenue will increase: The annual revenue from the sale of electricity with the commissioning of more stations was estimated to increase from about Rs. 1,000 crores in the mid-1990s to over Rs. 2,500 crores by the turn of the century. India's nuclear power programme was earning between Rs. 150 crores and Rs. 200 crores a year from sale of power, despite a very low tariff. The sales of ilmenite and other rare earths fetched about Rs. 11 crores a year, while isotopes earned about Rs. 2 crores. By 1993, the atomic energy programme was expected to earn more than it would spend.

The members were informed that availability of heavy water would not be a constraint on the programme. Technologies for heavy water production were now fully indigenous. There were five plants in operation. Taking into account the profile for a 10,000 MW nuclear power programme, three more were envisaged. The first of these, at Hazira, had been approved and was expected to be completed in 1991. Two more plants—one based on ammonia-hydrogen exchange and another based on hydrogen sulphide-water exchange—would be required by 1994-95.

Uranium reserves: Out of total reserves of the order of 73,000 tonnes of both 'indicated' and 'inferred' categories of uranium, about 68,000 tonnes were distributed in Singhbhum district (Bihar), and the balance in parts of Madhya Pradesh, Meghalaya and Karnataka. The Jaduguda mine was expected to continue producing uranium at the rate of 130 tonnes a year for quite some time. In addition, three more deposits had been taken up for establishment of mines and mills.

The currently known uranium reserves in the country could support a pressurised heavy water reactor (PHWR) programme of about 10,000 MW for a design life of 30 years. Even with the proven reserve of 70,000 tonnes, it was possible to attain an ultimate capacity of about 350,000 MW by the latter half of the 21st century, using heavy water reactors followed by fast breeders.

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CSO: 5150/0109

INDIA

AEC CHAIRMAN INTERVIEWED ON LESSONS OF CHERNOBYL

Madras THE HINDU in English 11 May 86 p 2

[Text] THE following is the text of the interview with Dr. Raja Ramanna, Chairman of the Atomic Energy Commission, on the Soviet nuclear disaster and its lessons.

THE HINDU: What is your reading of the fire at the Chernobyl nuclear reactor near Kiev?

Dr. Raja Ramanna: It is unfortunate that the fire had crippled the reactor. We do not have full facts about the accident. I had not seen the reactors working in Soviet Russia. From what I learnt from other colleagues, some of the reactors are accident prone, because they do not have the double containment system. By this system the radioactive releases were minimised by the prestressed concrete leak-proof reactor enclosed in a reinforced cement concrete building.

The Russians are probably cost conscious and do not want to waste money. One of the factors which compelled the Atomic Energy Commission in this country not to follow the Soviet system of not having a double containment system was to make the reactor building completely safe from any hazards.

THE HINDU: How many reactors are there in the Soviet Union?

Dr. Ramanna: About a hundred.

Q: Why did they not inform the public about the full nature of the accident?

Dr. Ramanna: It is a very difficult question to answer. Probably you know the answer. But I understand the Russians had become panicky and nervous when the accident occurred. That might be one of the factors in their delay in informing the public about it.

THE HINDU: Do the other nuclear countries have a double containment system?

Dr. Ramanna: Yes. In the United States and also in other nuclear producing countries. In the beginning, immediately after the war, some of these countries did not attach great importance to this system, more particularly so in plants which produced nuclear arms. There even if the accidents occurred, they did not see the light of day. They also did not mind if a few persons died in the process.

(He recalled that sometimes bombs had exploded while in flight like the accidents in Spain and in Ireland.)

THE HINDU: How far are our nuclear reactors safe? Have they adequate in-built safety systems?

Dr. Ramanna: Our nuclear reactors are a hundred per cent safe. They are water-to-water reactors. Unlike as in the Soviet Union where they have got graphite reactors—graphite is a very dangerous substance. They are very much old fashioned and when fire breaks out it is very difficult to put them out. As in Chernobyl, they cannot pump in water because the fire will spread by the chemical reaction. They have to pour sand and lead to insulate the reactor.

The authorities of the Atomic Energy Commission are also in constant touch with other advanced nuclear countries on the latest safety [as published] safety measures in the operation of nuclear reactors. At these meetings discussions on PRA (Protection Risk Accident) is one of the items on the agenda

and they exchange notes with the information if any accident had occurred. If an accident is caused by two spare parts or five spare parts why they had taken place and what measures they should take to ward off accidents in future. PRA discussion is a must now. At times three or four international conferences take place. I will be going to Vienna in July and will come to know more about the accident at the Chernobyl nuclear reactor.

One special factor about Indian scientists is that they are proverbially cautious. They are all degree holders in engineering and highly qualified. After they are taken in the (Atomic Energy) establishments, they are given special training in handling these sophisticated units.

The same cannot be said of some of the advanced countries. Because of the shortage of manpower, they take less qualified people. That is one of the reasons why human error creeps in, causing accidents.

We feel proud that no fatal accident has taken place in any of the reactors. Now, we have given importance to automation and computers and these new facilities lessen the cause of the accidents.

One of the factors to be noticed in the atomic energy establishments is that they are located in green belt areas. Lots of trees are planted and they provide the best cover against radiation. Another practice followed is the setting up of exclusion areas. A one-mile radius around the plant area is fully protected and fenced to contain any spin-off of accidents. We also see that housing sites and other industrial areas do not come up near these units for a distance of five miles. We have followed this pattern in Tarapur, Kalpakkam and Kotah.

THE HINDU: Do the other foreign nuclear nations also follow the same principle in the location of nuclear power reactors?

Dr. Ramanna: Yes. In France it is not the case. One can find houses near nuclear power stations. In Britain and Japan people are very disciplined and they follow the Government's directive as far as possible.

THE HINDU: What measures are in force at Trombay against radiation?

Dr. Ramanna: The authorities at BARC never compromise on lowering the standards at Trombay. They strictly enforce it. Scientists and workers should be hundred per cent clear and

they constantly monitor the individuals working [words indistinct] they are given rest and allowed to resume work once they show a normal level in the absorption of radiation.

THE HINDU: Are heavy water plants free from trouble now?

Dr. Ramanna: All the plants are working well except Talcher in Orissa where they had a fire accident recently. (He complimented the fire brigade for doing an excellent job in extinguishing the flames. He regretted that labour trouble was affecting the progress of the plant).

Summing up, Dr. Ramanna said that our establishments are manned by capable hands, experienced scientists, engineers and skilled workers. The inbuilt safety measures provided in these units are "the best, comparable to any in the world".

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CSO: 5150/0110

INDIA

NUCLEAR EXPERTS SEE NO DANGER FROM CHERNOBYL

Madras THE HINDU in English 1 May 86 p 1

[Article by G. K. Reddy]

[Text]

NEW DELHI, April 30.

The Prime Minister, Mr. Rajiv Gandhi, conveyed India's sympathy to the Soviet Union over the nuclear accident at the Chernobyl power plant in the Ukraine, when the Soviet Deputy Prime Minister, Mr. I. V. Arkhipov, called on him today before returning to Moscow after attending the annual ministerial meeting of the Indo-Soviet Joint Commission.

Mr. Arkhipov who conveyed to Mr. Gandhi a personal message from the Soviet leader, Mr. Mikhail Gorbachev, could give only bare details of what exactly caused this major mishap, since he had left Moscow for Delhi before this accident.

Possible dangers: The experts of the Indian atomic energy establishment in Bombay are being consulted about the possible dangers of part of the radio-active cloud drifting towards the sub-continent through some unexpected changes in the seasonal wind direction. But those with a modicum of knowledge of the hazards of nuclear explosions, or accidental escape of radio-active gases, think that this is a very remote possibility because of the Himalayas separating Central Asia from the Indian sub-continent.

The disaster at this eight-year-old plant is reported to have been caused by a meltdown of the stricken nuclear reactor's uranium fuel core which led to a fire that burnt out of control and blew the top of the reactor, spewing radio-active debris into the atmosphere. Indian experts will study all aspects of this accident, to assess the adequacy of control systems and monitoring procedures.

From all accounts it was a major disaster since, according to the photographs of the stricken nuclear plant taken by U.S. spy satellites, the top of one of the four reactors of the 1,000 MW power station had blown off, leading to an uncontrollable emission of deadly radio-active gases which mingled with low clouds and started drifting over Europe.

Same design: There are 50 nuclear plants in operation in the Soviet Union generating nearly 30,000 MW of power with a good record of safety. About half the number of these plants are of the same design as the ill-fated one at Chernobyl. Except for one plant at Sverdlovsk in the Urals which was hampered by leakages of radio-active fluids, the rest of Soviet nuclear power plants have been operating satisfactorily except for routine maintenance problems.

But the two 500 MW nuclear power plants that India has been planning to set up with Soviet assistance are of the RBMK type at Chernobyl using enriched uranium with light water cooled graphite moderators which were considered quite safe until this accident. So the Indian atomic experts, who have been working on natural uranium and heavy water reactors, will have to re-evaluate the technical aspects and safety standards of these Soviet-designed nuclear power plants before proceeding further with this agreement.

After the nuclear blaze at the stricken plant has been controlled and the other three reactors rendered safe, the Soviet Union will probably order its own inquiry to identify the causes of this catastrophic accident. It is not unlikely that experts from other Socialist countries using the Soviet designed RBMK-type reactors for power generation would be invited to visit the site and share this information.

At that stage, an Indian team might be sent to Moscow for further discussions on the designs details of these reactors, if India is still interested in setting up the proposed two plants with Soviet assistance.

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CSO: 5150/0104

INDIA

RADIATION TESTS CONDUCTED ON MOSCOW-CALCUTTA PLANE

Calcutta THE TELEGRAPH in English 13 May 86 p 4

[Text]

Calcutta, May 12: Scientists here have conducted tests on an Aeroflot plane to determine whether it was contaminated by radiation from the Chernobyl nuclear plant while it was flying from Moscow to Tashkent on its way to India.

The scientists belong to the Variable Energy Cyclotron Centre (VECC) at Salt Lake. They refused to divulge their findings, having sent their report to the Bhabha Atomic Research Centre (BARC) at Bombay. This will be forwarded to the chairman of the Atomic Energy Commission.

Officials of the Soviet airline in Calcutta said that while the aircraft must have been free of radioactive contamination when it was allowed to take off from Moscow, it may have come into contact with radioactive particles on the Moscow-Tashkent leg of the flight, which falls in the zone affected by the fallout from the Chernobyl explosion.

The radiation tests were carried out at Calcutta Airport on the instructions of the department of atomic energy of the Union government. State government officials said they did not know anything about the matter. Airport sources said instructions had been issued to conduct such tests on all flights originating from or overflying the Soviet Union and parts of northern and central Europe in which radioactivity from the Chernobyl blast had spread.

The Aeroflot plane carrying 50 passengers landed here on Thursday after a stopover in Bombay. The tests were carried out immediately afterwards by a three-member team of radiological experts from the health physics unit of the VECC, which is a unit of BARC.

Soviet officials in Calcutta have refuted the reports of radioactive contamination of the Aeroflot plane. Mr B.P. Petrunin, a vice-consul, said he had contacted the VECC scientists who had carried out the tests and had been assured that the level of radioactivity inside the aircraft had not been found to be anythng more than that normally present due to background radiation.

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CSO: 5150/0111

INDIA

ATOMIC ENERGY DEPARTMENT RELEASES ANNUAL REPORT

Bombay THE TIMES OF INDIA in English 2 May 86 p 27

[Text] NEW DELHI (PTI): A completely indigenous nuclear robot to facilitate automation in the atomic power plants is being developed by the scientists of the Bhabha Atomic Research Centre, Bombay.

The robot, which would move around and perform operations in reactor maintenance, decontamination and decommissioning of nuclear facilities, is likely to be completed by 1990, according to the 1985-86 annual report of the department of atomic energy.

The report says BARC had also started work on development of a mobile robot and its central workshop at Trombay had successfully designed and developed a six-axis multi-purpose robot of 50 kg. capacity.

A prototype five-axis articulated robot was also designed, manufactured and tested, according to the report.

WORK ON LASER

Referring to the work on laser the report says the BARC has developed a copper vapour laser (CVL) for pumping dye laser which is capable of spectral tuning and narrowing of the output.

The report says the completion of the indigenously designed and built 100-MW research reactor 'Dhruva' at Trombay, the commissioning of the second unit of the Madras atomic power station and the achievement of the criticality by the fast breeder test reactor at Kalpakkam were the three major achievements in the Indian nuclear programme during the year.

Based on BARC-developed technology, a vitrification plant for the management of high-level radioactive wastes was commissioned at Tarapur. The scientists had also successfully commissioned a five MW 'MHD' pilot plant for more efficient electricity generation at Tiruchirapalli in March 1985.

HEAVY WATER

Referring to the 500-MW pressurised heavy water reactor, the report says a conceptual design, preparation of feasibility report, appointment of main consultant for all conventional systems and all plant structures for reference inland site had been completed.

On the heavy water production front, the department achieved significant improvements in the availability of the Baroda plant and performance of the Tuticorin plant.

The report says erection of equipment and piping is progressing at the Narora atomic power station. The erection sequence of critical equipment is being modified to minimise the delay in the project completion.

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CSO: 5150/0105

INDIA

OFFICIAL DISCUSSES CAUSE OF HEAVY WATER PLANT FIRE

Madras THE HINDU in English 3 May 86 p 1

[Text]

BHUBANESWAR, May 2.

The major fire which broke out in the heavy water plant of the Department of Atomic Energy at Talcher, 170 km from here, on Tuesday last, was due to "failure of one of the aluminium liners in the gasket used on the cover joint in one of the synthetic gas compressors".

Mr. K. S. Bhimbhat, Executive Director of Heavy Water Projects, said after a preliminary examination, that it has been found that the liner in the gasket used on the cover joint of the synthetic gas compressor had failed and this could be the cause of the fire. He, however, said a team of experts would be coming shortly to make a detailed study.

Mr. Bhimbhat said the engineer of the heavy water plant had done an excellent job, controlling the fire. He said the plant was operating at 290 atmospheres as against its capacity of 320 atmospheres. The supply of gas to the heavy water plant was immediately stopped and the gas in the pipeline was allowed to burn out and the fire could be brought under control in an hour.

Wind direction: The Executive Director said it was indeed fortunate that at the time of the accident, the direction of the wind was towards the control room in the northwest and not in the opposite direction and as a result, the control room was totally damaged.

Asked about the prospects of resuming production, Mr. Bhimbha said "it will take several weeks, may be three months". Taking advantage of the shutdown, the annual maintenance and modifications in some of the important sectors would be taken up. He said that among the components which will undergo modification will be the pumps, ammonia coolers and exchangers.

Mr. Bhimbhat said the Talcher plant had not been able to have a stabilised production till November last year because of the power problem.

He hoped that the performance of the plant would improve after the modifications and the plant would stabilise.

The plant is designed to produce 62 tonnes of heavy water annually.

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CSO: 5150/0106

BRIEFS

PRECAUTIONS AT NARORA--New Delhi, 8 May--Adequate precautions have been taken to guard against the danger of nuclear leakage or radiation from the Narora atomic plant, the Minister of State for Atomic Energy, Mr Shivaraj Patil, told the Rajya Sabha today. Allaying the apprehensions of members during question hour, Mr Patil said while the plants at Kota and Kalpakkam were based on indigenous technology, certain modifications incorporating the latest technology formed part of the Narora plant. Mr Suresh Kalmadi said the Narora plant was situated on the seismic belt, prome to earthquakes. Moreover, it was only 240 km from the capital. "Is there any move to shift the plant," he asked. Mr Nirmal Chatterjee cited the recent accident in a Soviet nuclear power plant. Mr Patil informed the member that the Narora plant was so constructed as to absorb earthquake shocks. Besides, it was situated in zone III of the seismic belt. All precautions had been taken, he assured the members. The plant would be commissioned on schedule. It consists of two units of 235 MW capacity each. There had been no delay in the supply of turbine by BHEL, he said. [Text] [Madras THE HINDU in English 9 May 86 p 6] /9274

KARNATAKA POWER PLANTS--Coimbatore, 7 May--Dr M. R. Srinivasan, Chairman, Nuclear Power Board, said here on Wednesday that the Centre had cleared the setting up of four nuclear power plants, two each in Karnataka and Rajasthan during the Seventh Plan period. The plants would be of 235 MW each and cost Rs. 610 crores. Mr Srinivasan who was on a brief visit here, told pressmen that there was no need for concern about the safety of nuclear power plants in India which were of a different design from that of the Soviet nuclear reactor in Chernobyl. He said the Indian nuclear power reactors had been provided with extra safety devices and any more precautions, if necessary would be taken. He said a 180-tonne transformer was being moved to Kalpakkam from Naroda to ensure uninterrupted power supply. He hinted at the possibility of setting up a nuclear power plant at Kudankulam in Tirunelveli district in the near future. [Text] [Madras THE HINDU in English 8 May 86 p 12] /9274

PROGRAM INQUIRY URGED--Kalpavriksha, a Delhi-based environmental action group, has urged voluntary organisations, lawyers, journalists and concerned citizens to campaign for a public enquiry into India's nuclear energy programme. In a statement on Friday, it noted that India had five nuclear power plants and five more were under construction. Some of the proposed nuclear plants, it pointed out, were situated in areas like Kaiga and Kakrapara where the local people were opposed to them. The statement noted that the Tarapur station,

according to the Citizens Report on the State of India's Environment 1984-85 was 200 to 500 times dirtier and more expensive. Kalpavriksha has appealed to all concerned groups to write to the Prime Minister and the Chief Justice of India demanding a public enquiry into the nuclear establishments in the country. [Text] [New Delhi PATRIOT in English 3 May 86 p 3] /9274

SOVIET, FRENCH OFFER--New Delhi, 30 Apr (UNI & PTI)--The Soviet Union and France have offered to set up a nuclear power plant in India, the minister of state for science and technology, Mr Shivraj Patil, told the Lok Sabha today. He said in a written answer that discussions on various aspects of the offer were on with the Soviet authorities while preliminary talks had taken place with France. [Text] [Bombay THE TIMES OF INDIA in English 1 May 86 p 16] /9274

CSO: 5150/0107

GREENPEACE DEMONSTRATES SECURITY HAZARDS

Jerusalem THE JERUSALEM POST in English 18 May 86 p 4

[Text]

LONDON (AP). – The Greenpeace environmental group said two of its members on Friday boarded a British ship carrying spent nuclear fuel in the Mediterranean to show the vessel's vulnerability to attack.

The group, in a statement issued from its headquarters at Lewes in southern England, named the ship as the 2,486-ton Mediterranean Shearwater.

The vessel is owned by British Nuclear Fuels, the state-owned company that runs Sellafield, the world's largest nuclear reprocessing plant, in northwest England.

Greenpeace, which is campaigning to get the leak-plagued plant closed, said the two people who boarded the Mediterranean Shearwater came from Greenpeace's volunteer crew on its ship, the Sirius. Nobody was hurt. The incident happened near the Strait of Gibraltar.

Greenpeace said the Sirius had been searching for the Mediterranean Shearwater since Thursday night after receiving information that it had left Civitaveccia in Italy on Tuesday with 30 tons of spent fuel from the Latina nuclear reactor. The Mediterranean Shearwater is bound for Barrow-in-Furness, near Sellafield.

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GHANA

BRIEFS

NUCLEAR TECHNOLOGY IN AGRICULTURE--The Ghana Atomic Energy Commission is using nuclear technology to improve the quality of some selected crops and reduce post-harvest losses, Dr A. K. Ahafia, Director of the Commission, told the Ghana News Agency at Kwabenya yesterday. Dr Ahafia said the studies were supported by the international Atomic Energy based in Vienna, Austria. He said projects being carried out in the Nuclear Agriculture Department of the Commission consisted of studies to improve soil science, plant breeding and food irradiation. He said the plant breeding studies were to change, among other things, the characteristic of certain selected crops to be different from the parent stock and produce certain desired effects like increase yield, disease resistance and improved quality of the material. The studies are being undertaken in conjunction with the Universities of Science and Technology, Kumasi, the Cocoa Research Institute at Tafo and the University of Ghana, Legon. [Text] [Accra GHANAIAN TIMES in English 10 May 86 p 3] /9274

CSO: 5100/28

SEARCH FOR URANIUM DEPOSITS STEPPED UP

Lusaka ZAMBIA DAILY MAIL in English 23 May 86 p 7

[Text]

NO LARGE deposits of uranium have been found in Zambia yet by any of the five international companies involved in its exploration.

The small isolated deposits of low grade uranium identified are not viable for commercial exploitation.

However the companies are still hopeful of finding viable deposits and, together, spend over five million US dollars annually in exploration work.

This was said by the acting director of the Prescribed Minerals and Materials Commission, Mr Nick Money, when he commented on progress made by exploration firms in the hunt for uranium, a strategic mineral.

The companies involved in uranium exploration are Agip SPA of Italy, Saarberg Interplan, and Power Nuclear Fuel Development Corporation of West Germany, Cogema, and Central Electricity Generating Board. Most of these companies have been actively involved in exploration since 1980.

Exploration is done around Lake Kariba, Kariba Extension, Luangwa, Copperbelt and in the North-Western Province in Solwezi district, Kawanga and Mwombezhi areas.

Uranium exploration has been carried out intermittently for a long time but did not go into full swing until the work carried out by the Geological Survey during the 1970s. The Uranium conference of 1977 increased interest in the project.

The Uranium Act (Prescribed Minerals and Materials Commission Act) was passed in 1976 and international companies applied for licences and were granted them under agreements with the commission.

Prospecting and exploration is a continuous process, the licences are generally valid for four years of prospecting, three years of exploration and up to 25 years of mining.

Mr Money said the commission's staff position had improved and with the assistance of the Geological Survey it was now able to inspect exploration work.

Last year it was reported that the commission was unable to monitor uranium exploration work due to lack of adequate professional staff and transport.

Meanwhile, Chief Nkana of Ndola Rural has appealed to the government to grant licences to small scale miners quickly for prospecting precious gemstones, ZANA reports.

"The delays in issuing mining licences for emerald prospecting is worrying me because there are many people who have told me that they want to set up mines in my area but have not been given licences," said Senior Chief Nkana.

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END